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# PALÆONTOLOGY:

VOLUME III.

CONTAINING DESCRIPTIONS AND FIGURES OF THE ORGANIC REMAINS OF THE LOWER HELDERBERG GROUP AND THE ORISKANY SANDSTONE.

1855-1859.

BY JAMES HALL.

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PART II : PLATES.

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# CORRIGENDA.

PLATE 1, fig. 8. Some of the short spines at the summit of the proboscis are erroneously merged into the branches of the arms, making the latter appear as if continuations from the spines.

PLATE 4. The references of figs. 10 and 11 should be reversed.

PLATE 12, figs. 9, 10, 11 & 12. *Orthis quadrans*, referred to in text as *O. subcarinata.* A study of the interior structure of the valves has shown these forms to be quite distinct from *O. subcarinata*, and a well-marked species.

PLATE 68, p. 341. *Bucania profunda* (*B. profunda*, n.s., by mistake) should be cited *Euomphalus profundus*, VANUXEM, Geol. Report Third District New-York, p. 117, f. 2.

PLATE 72 A. Erroneously referred to in the text, pages 347 and 348, as PL. 62 A. The correction on explanations of plates does not correct the reference.

PLATE 73, fig. 24 *a*, is an enlargement of a portion of the eye of *P. hudsonicus*.

*** PLATES 79 A and 79 B, containing figures of *Leperditia* and *Beyrichia*, are omitted from this volume, but will be given in a future one.

PLATE 95 A. The reference †, after *Strophodonta magnifica*, should be after *Orthis cumberlandia.*†

† This species may be compared with *Orthis hipparionyx*.

PLATE 106. Explanations of figures omitted :

Fig. 3. *Rhynchonella multistriata*, p. 440.

Fig. 4. *Rhynchonella principalis*, p. 443.

PLATE 92, and page 406, change the name *Discina grandis* to *Discina ampla*, n.s.; the former name being preoccupied.

*** In the text of the Introduction, page 8, in the righthand column of names of rocks, the Galena limestone is by mistake placed below the Trenton limestone, when it should be placed above.

# PLATE 1.

Page

Fig. 1 – 9. HOMOCRINUS SCOPARIUS. 102

1. An individual showing the anal side, and the proboscis entire. The extremities of the arms are broken off on a line with the summit of the proboscis.
2. An individual preserving the arms in part, with the proboscis removed.
3. A specimen of limestone with several individuals in different states of preservation.
4. A group exhibiting the mode of growth.
5. A fragment of a column somewhat larger than usual.

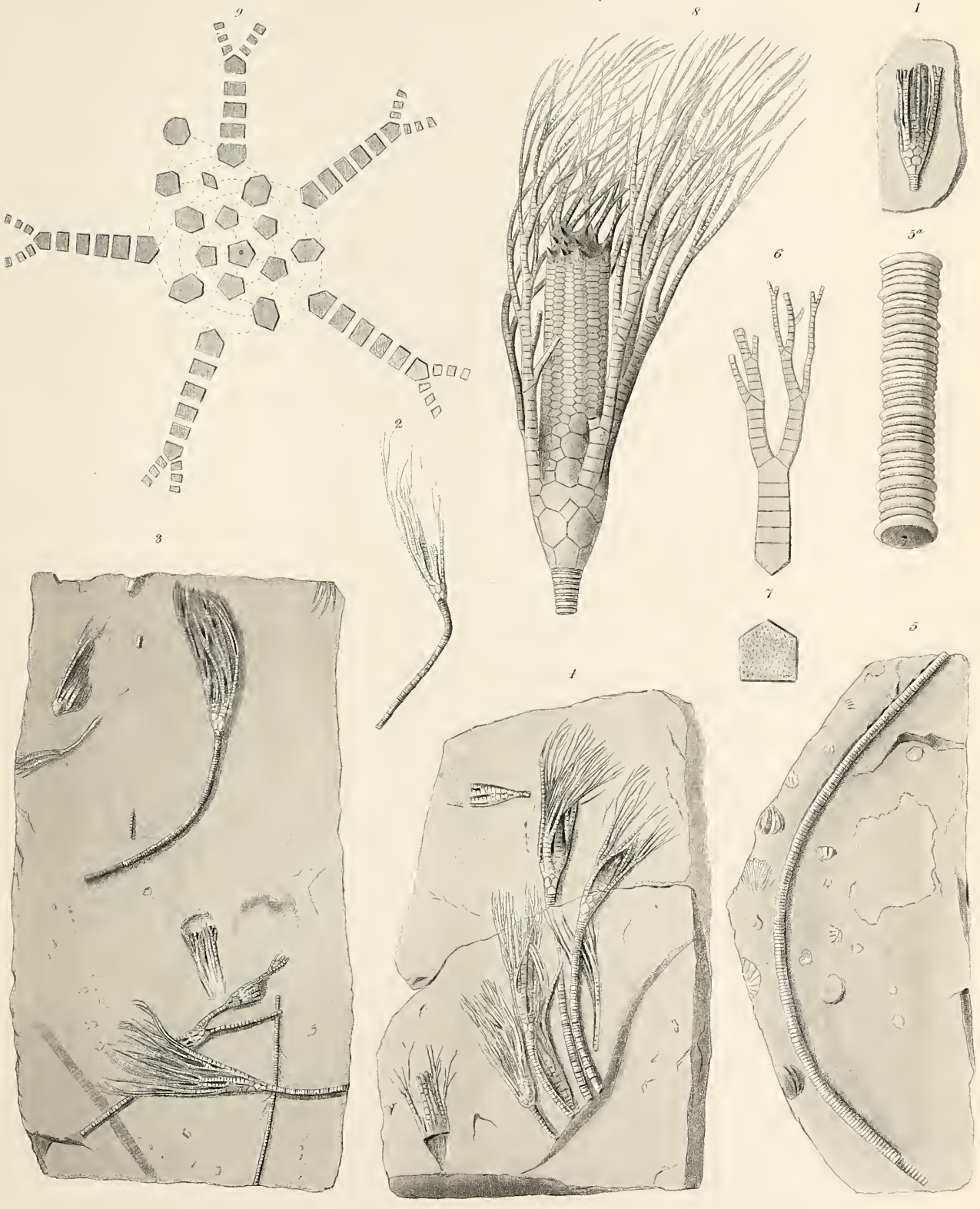
5 *a*. Enlargement of a portion of the column, showing the gradual approach to the pentagonal form.

6. Enlargement of a portion of an arm, showing the mode of bifurcation, etc.
7. Enlargement of a radial plate, showing the granulate surface.
8. Enlargement of an individual, showing the structure of the body, arms and proboscis.
9. Diagram showing the structure of the body and arms to the first bifurcation.

# LOWER HELDERBERG GROUP.



(CRINOIDEÆ)

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# LOWER HELDERBERG GROUP.



(CRINOIDEÆ.)

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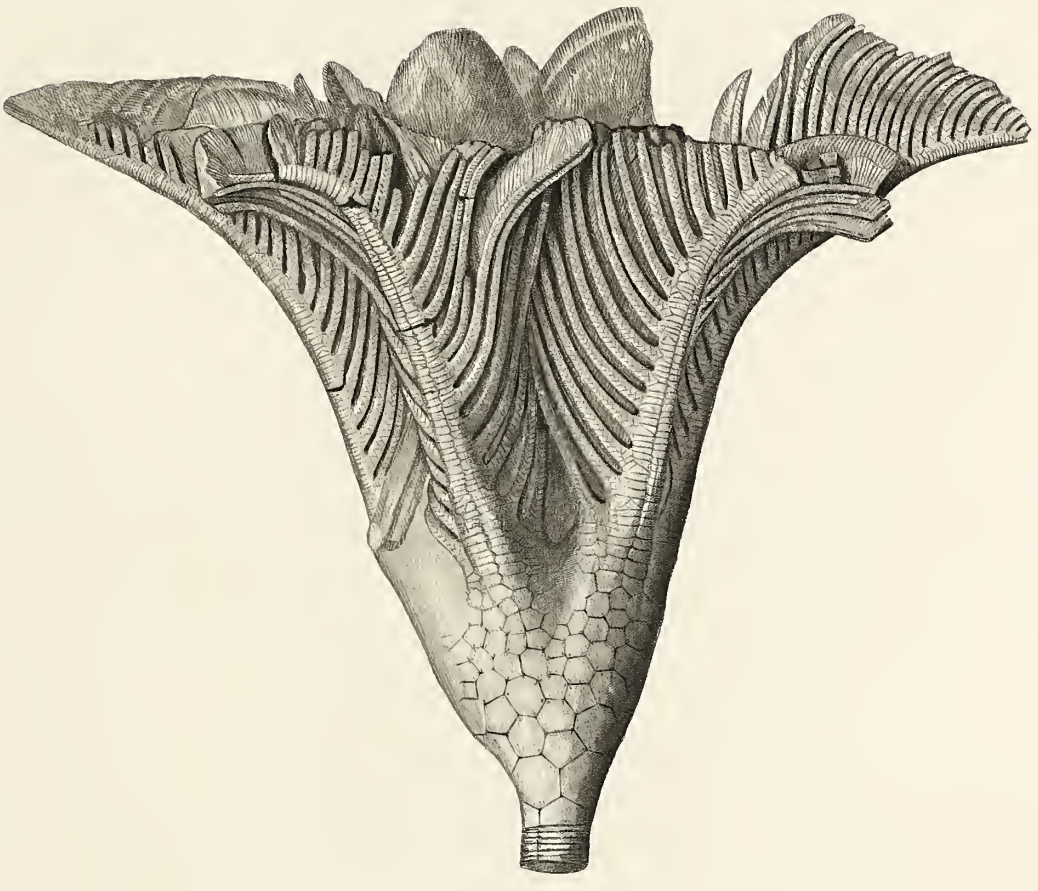

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# PLATE 2.

Page

Fig. 1 – 5. MARIACRINUS NOBILISSIMUS. 105

1. An individual nearly entire, showing a few joints of the column.
2. An enlargement of a portion of one of the arms, with the bases of the armlets.
3. An enlargement of a portion of one of the armlets, showing the tentacula.
4. An enlargement of a part of one of the primary tentacula, with the secondary tentacula attached.
5. Diagram showing the structure of the body and bases of the arms.

Fig. 6. MARIACRINUS RAMOSUS. 147

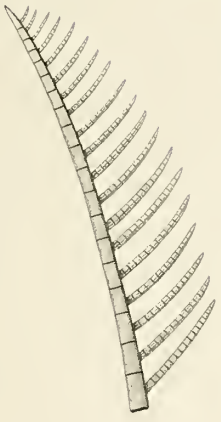
6 (by error, fig. 2 & 3 of text). Figure of a specimen of the natural size, showing the anal area and postero-lateral rays.

The diagram referred to in the text has not been given.

N. B. This plate has been re-engraved, to correct the error in the drawing of the structure of the body and arms of the crinoid fig. 1 of the preceding Plate 2.

(CRINOIDEÆ.)

4



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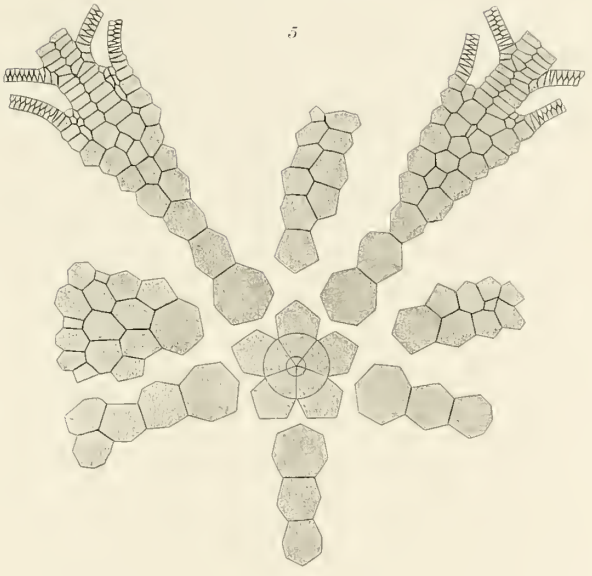

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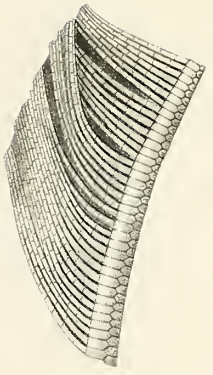

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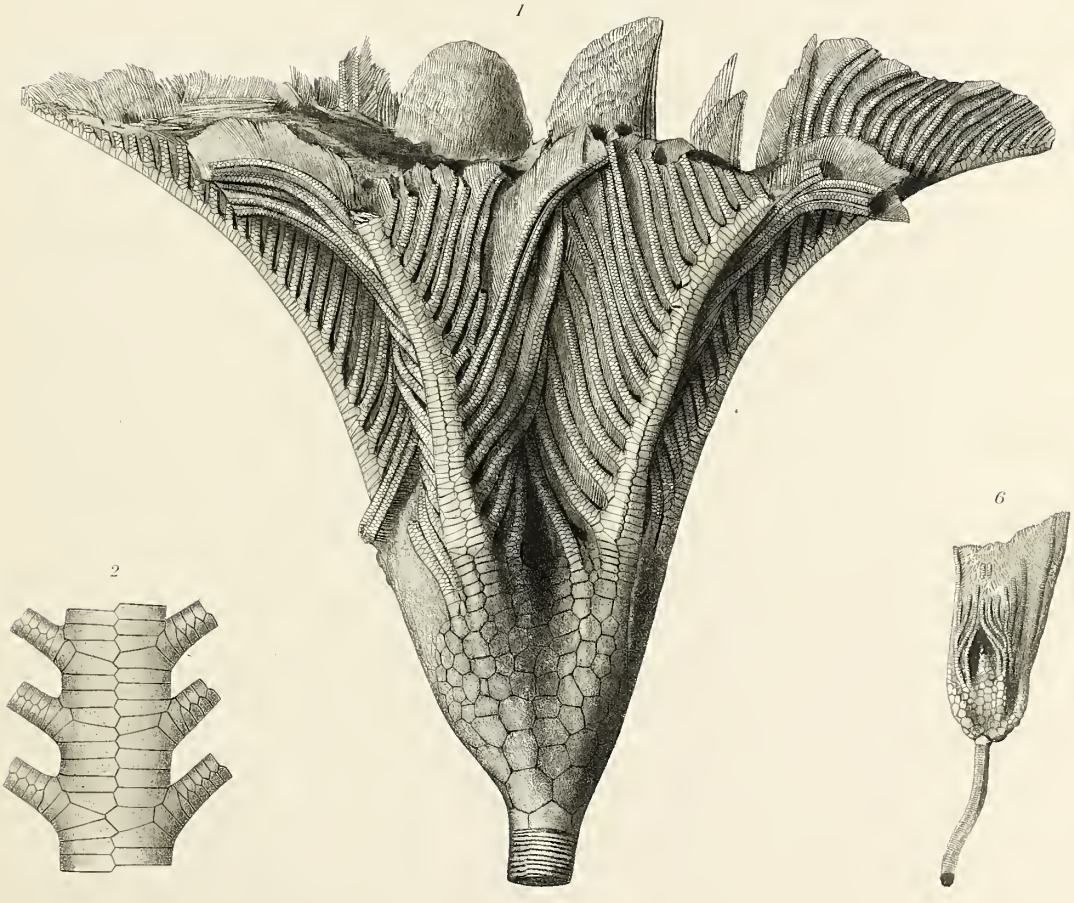

2



6

# PLATE 2 A.

Page

Fig. 1. MARIACRINUS NOBILISSIMUS. 105

1. A large individual, showing the anal or irregular side of the specimen, with numerous anal or interbrachial plates, the base of the proboscis, arms, etc. The upper part of the proboscis is covered by adhering stony matter.

# LOWER HELDERBERG GROUP.

## (CRINOIDEÆ.)



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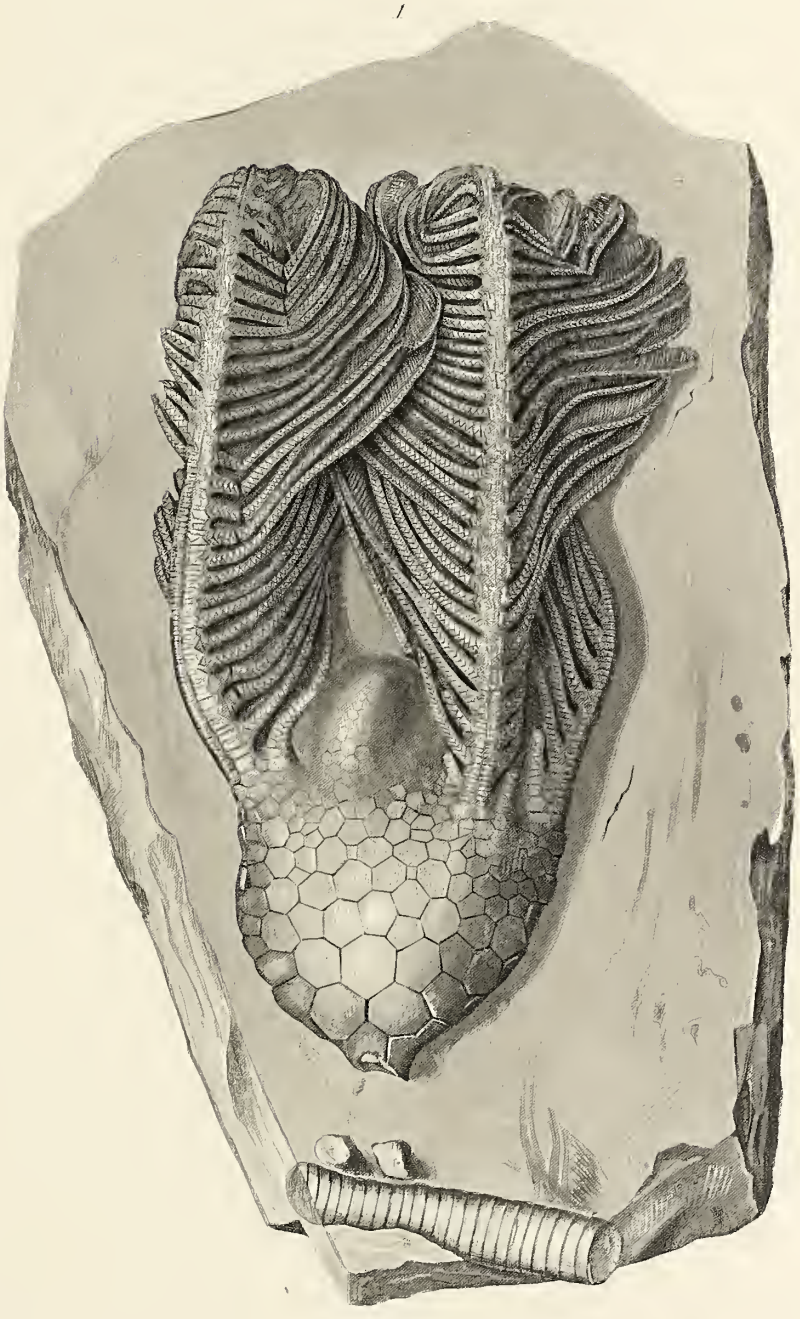


# PLATE 3.

Page

Fig. 1 – 4. MARIACRINUS PACHYDACTYLUS. 107

1. An individual preserving the body and greater portion of the arms, with several inches of the column.
2. The body and lower part of the arms, showing the surface characters in a good degree of preservation.
3. A specimen with arms, armlets, and tentaeula nearly entire.
4. Diagram illustrating the structure of the body and one arm to the second bifurcation of the brachial plates.

4 *a*. Enlargement of a portion of an arm, showing the arrangement of plates and origin of armlets.

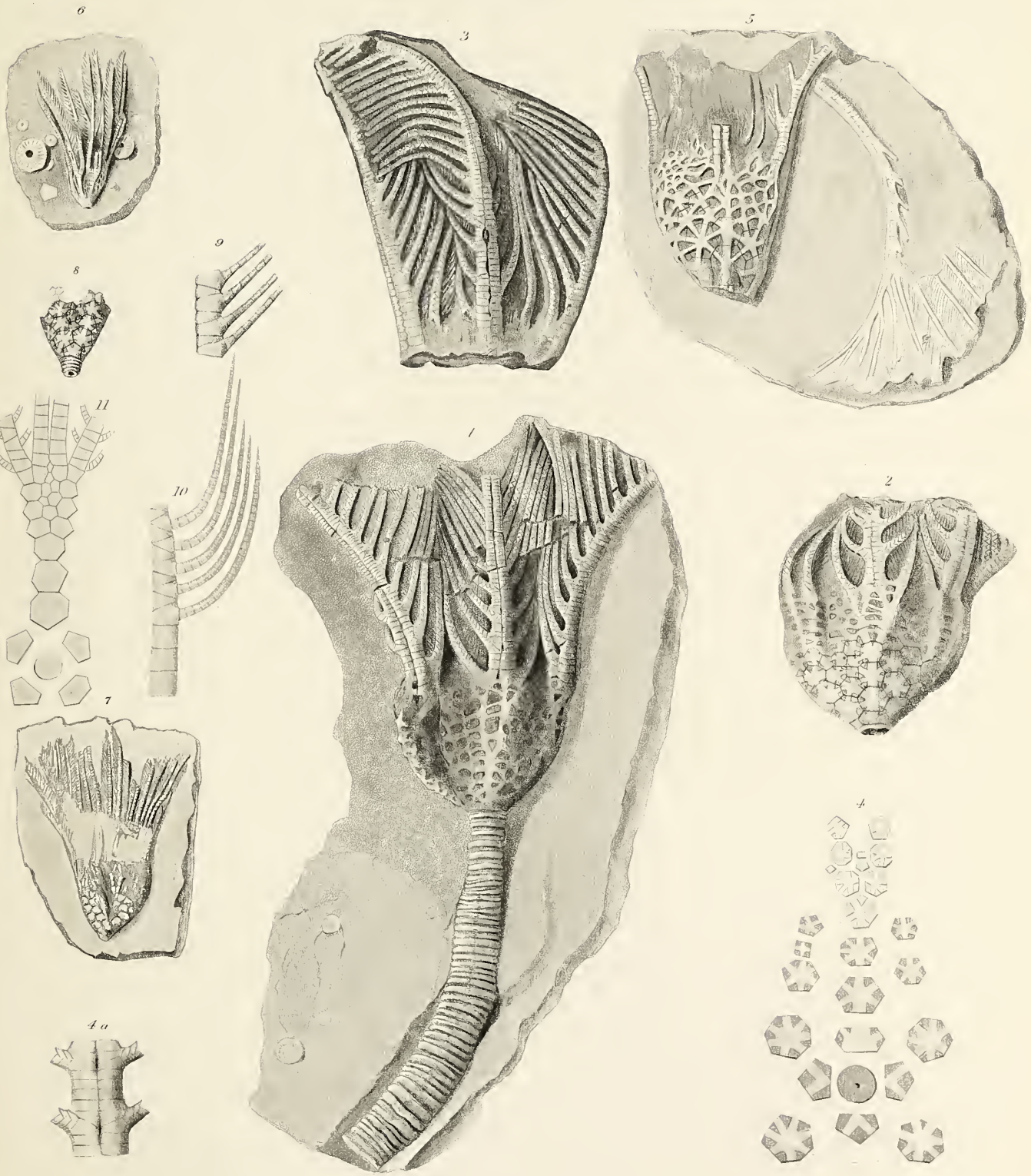
Fig. 5. MARIACRINUS PAUCIDACTYLUS. 109

5. A specimen preserving the body above the basal plates, and a portion of several of the arms and armlets.

Fig. 6 – 11. MARIACRINUS PLUMOSUS. 110

6. A small individual preserving the body and arms nearly entire, with a small portion of the column.
7. A larger individual.
8. Enlargement of the body of fig. 6.
9. Enlargement of the arm-joints and tentacula.
10. A similar enlargement from another specimen.
11. Diagram showing the structure of the body and arrangement of the brachial plates.

(CRINOIDEÆ.)



# PLATE 3 A.

Page

Fig 1 & 8 – 12. MARIACRINUS MACROPETALUS. 111

1. A specimen showing the base and a portion of the body.

10. A fragment of the column with the rootlets attached.

11. A fragment of the column with the rootlets worn off.

12. Another fragment with rootlets attached.

8 & 9 are are detached rootlets of the same species, and should be reversed in position upon the plate.

Fig. 2. MARIACRINUS STOLONIFERUS. 112

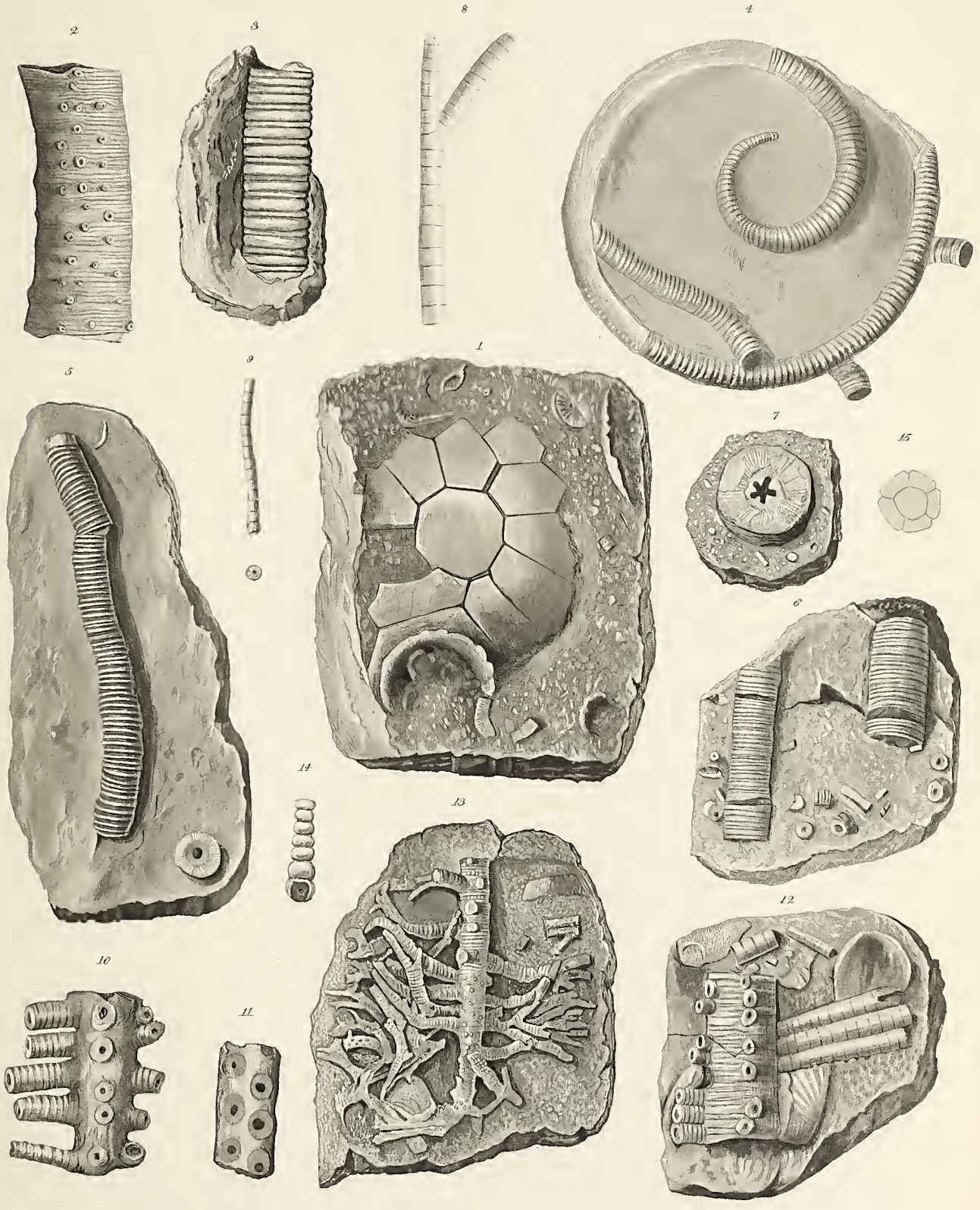
2. A fragment of the column of this species.

3, 4, 5, 6, 7 & 13 are fragments of columns, etc. of undetermined species.

# LOWER HELDERBERG GROUP.



(CRINOIDEÆ)

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John E. Gavit &c., Albany, N.Y.

# PLATE 3 B.

Page

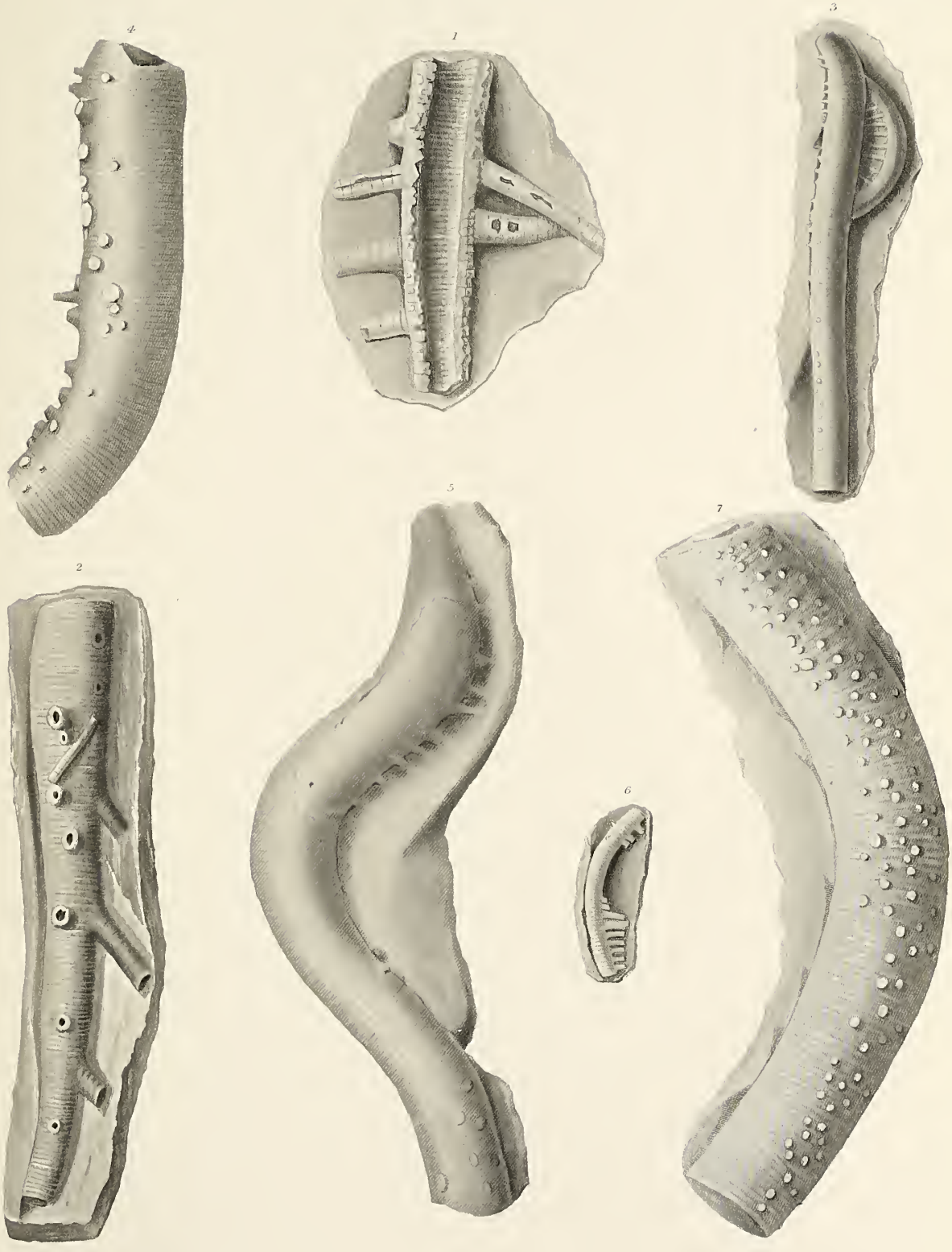
Fig. 1 & 2. MARIACRINUS MACROPETALUS. 111

1 & 2. Roots and rootlets of this species.

Fig. 3 – 7. MARIACRINUS STOLONIFERUS. 112

3, 4, 5, 6 & 7. Several fragments of columns of different size, each showing the small attached rootlets, or the points from which they have been broken.

CRINOIDEÆ



# PLATE 4.

Page

Fig. 1, 2, 3, 4, 5. PLATYCRINUS PLUMOSUS. 113

1. A specimen preserving a part of the column, with the branchlets broken off. The body is too imperfect to be represented in detail, but the arms and tentacula correspond to those of fig. 2.
2. An individual nearly entire, with a small portion of the column and branchlets attached, and nearly covering the body. The arms are preserved nearly to their extremities.
3. An individual much crushed, showing the structure of the body and a portion of the proboscis. The small point for the attachment of the column is well shown in the figure.
4. Enlargement from fig. 2 of the first and second radial plates, the first armjoint, and succeeding plates of the arms and tentacula.
5. Structure of the body and base of arm, from fig. 3.

Fig. 6, 7, 8, 9. PLATYCRINUS PARVUS. 114

6. An individual nearly entire, with a small portion of the column from which originate the numerous branchlets which surround the body and extend beyond the arms.
7. A similar specimen, preserving more of the column, from which most of the branchlets have been removed.
8. Enlargement of a portion of the column (lower part of fig. 7), with the bases of the branchlets attached.
9. Enlargement of a single branchlet.

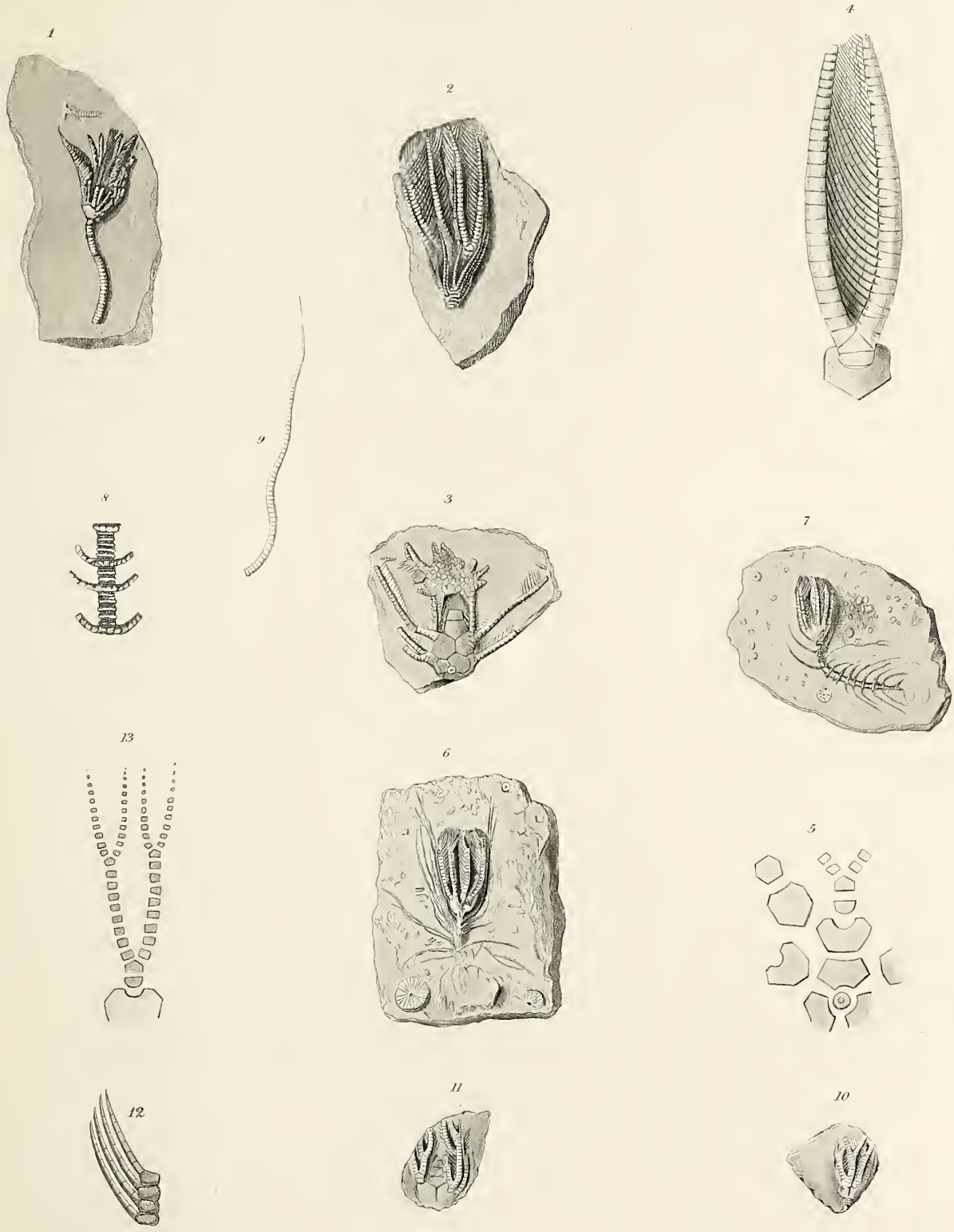
Fig. 10, 11, 12, 13. PLATYCRINUS RAMULOSUS. 115

10. An individual showing some irregularity in the bifurcation. The same specimen shows also two anal plates.
11. A small individual, preserving the arms above the second bifurcation.
12. Several joints of the arm, with tentacles attached.
13. Enlargement showing the structure from the first radial plate to the extremities of the arms, as far as preserved in the specimen fig. 10.

# LOWER HELDERBERG GROUP.



## (CRINOIDEÆ)

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# PLATE 5.

Page

Fig. 1 – 4. PLATYCRINUS TENTACULATUS. 116

1. The individual represented of the natural size.
2. Enlargement of arms and tentacles from the second radial plate; the two contiguous arms of the two pairs being continued with the tentacles as far as seen in the specimen.
3. Enlargement of the plates from the basal through the radial and brachial plates, and continuation of a single arm.
4. Diagram showing the structure.

Fig. 5, 6, 7. BRACHIOCRINUS NODOSARIUS. 118

5. A specimen with the tentacles more closely arranged than usual, and terminating below in a round condyle-like extremity.
6. A specimen preserving eight of the tentacles upon one side of the arm, and four upon the other.
7. An arm coiled, showing the points of attachment, with numerous detached fragments of tentacula.

Fig. 8 – 12. EDRIOCRINUS POCILLIFORMIS. 121

8 Basal view of a large individual, the proportional length being greater than usual.
9. Lateral view of the same.
10. Lateral view of a larger specimen.
11. Interior of the same.
12. Enlargement of the concavity of fig. 10, showing the depressions corresponding to the depressions in the margin and the concentrically striated surface. At each angle there is a slight depression or pore, which seems to communicate with the cavity between the basal and inner plate.

Fig. 13 & 14. ASPIDOCRINUS CALLOSUS. 123

13 & 14. Interior and exterior views of the specimen described.

Fig. 15 – 18. ASPIDOCRINUS SCUTELLIFORMIS. 122

15. The exterior of the base of an individual of this species.
16. The interior of the same.
17. Profile or lateral view of the same.
18. The interior of a large specimen.

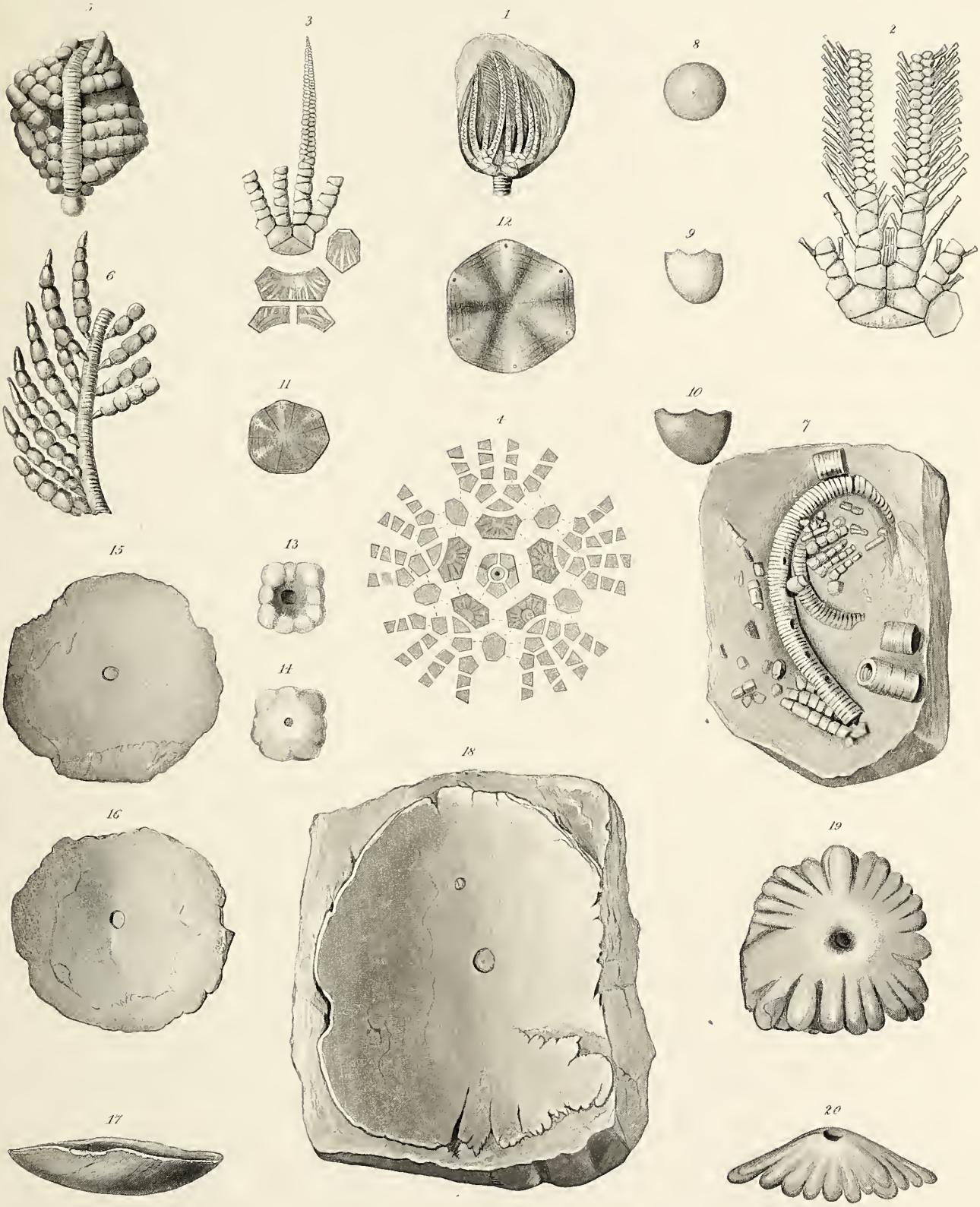
Fig. 19 & 20. ASPIDOCRINUS DIGITATUS. 123

19 & 20. Upper side and profile view of the specimen.

# LOWER HELDERBERG GROUP.



(CRINOIDEÆ.)

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# PLATE 6.

Page

Fig. 1, 2, 3. BRACHIOCRINUS NODOSARIUS. 118

1. The inner side of an arm with tentacles attached, showing on the right side one at unequal distance from the others.

2 & 2 *a*. Inner side of the base of an arm including the first three joints, with points of attachment for the tentacles, and the same enlarged.

3. Exterior surface of the same enlarged.

3 *a*. Transverse section, showing the form of the arm-joints.

Fig. 4, 5, 6. CORONOCRINUS POLYDACTYLUS. 124

4. Lateral view of a fragment of the upper part of the body and bases of the arms.

5. View of the summit, showing its structure and the origin of the arms.

6. Enlargement of some plates of the summit.

Fig. 7 – 15. Columns of undetermined CRINOIDEÆ. 125

7, 8, 9 & 10. Fragments of pentagonal columns, bearing nodes at the angles, which seem to have been the bases of little branchlets.

11, 12 & 13. Sections of pentagonal columns, showing varying degrees of angularity, till in the last one the angles project in wing-like expansions.

14. Fragment of Lower Pentamerus limestone, with pieces of columns of two or more species.

15. Section of a pentagonal column, showing marks of longitudinal division at the angles.

Fig. 16 – 21. TENTACULITES ELONGATUS. 136

16. An individual of medium size.

17. An individual of about the same length as the preceding, slightly compressed below, giving it an apparently greater breadth at the base.

18. A large individual having a length of three inches. On one side of the base, the greater distance between the annulations shows the interior structure with more elongate internodes.

19. Enlargement of a portion, showing the striæ.

20. An individual from which the exterior shell has been exfoliated, showing smooth annulations whose greatest diameter is near the upper edge.

21. A portion of the same enlarged, showing the appearance of the annulations magnified.

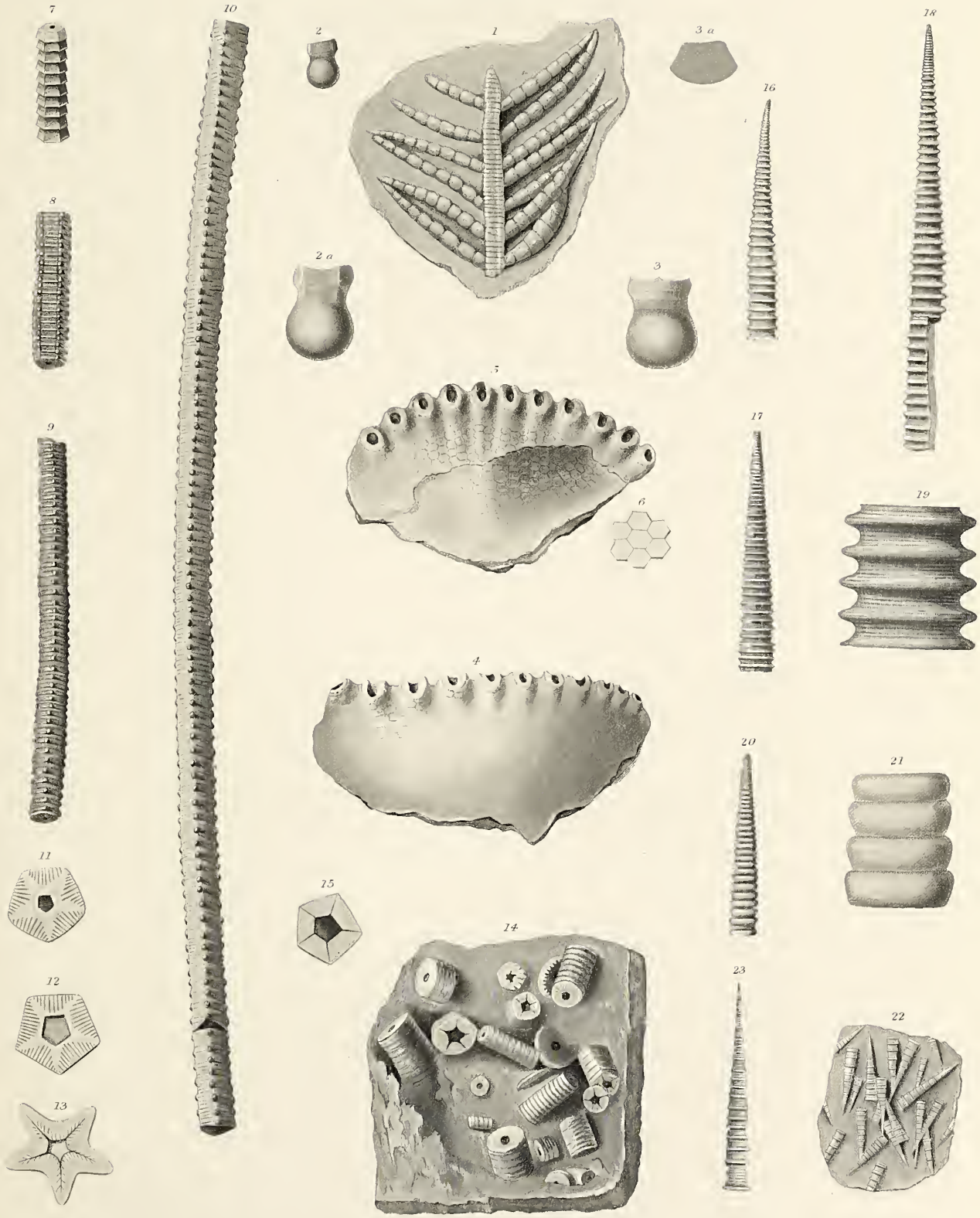
Fig. 22 & 23. TENTACULITES IRREGULARIS. 137

[ *Echinus gyracanthus* : EATON, Geological Text-book, 1832. This name was overlooked in the synonymy, and the specific designation of EATON has precedence over my own.]

22. A small portion of the surface of the stone, showing the abundant distribution of these bodies. On this specimen, which has a length of five inches and an average breadth of a little more than one inch, more than five hundred individuals may be counted; and the layer beneath, for the thickness of a quarter of an inch, is composed almost entirely of these fossils, giving more than ten times as many as can be seen upon the surface.

23. Enlargement of a single individual.

(CRINOIDEÆ. ETC.)




Meek lith.

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# PLATE 7.

Page

Fig. 1 – 23. LEPADOCRINUS GEBHARDI. 127

1. The right side of an individual, showing the arrangement of plates, pectinated rhombs, etc.
2. The anterior side, showing the pectinated rhombs at the base.
3. The posterior side, showing the ovarian aperture with the surrounding plates removed.
4. The left side of the same specimen. The prominence of the ovarian side over the opposite is well seen in 1 & 4.
5. A smaller individual with the column entire and the body mutilated. The base of the column is quite solid, showing no evidence of rings.
6. Another individual preserving the column and plates of the body, the latter somewhat crushed. The articulations are partially visible in the base of the column, which condition is in a measure due to wearing of the surface.
7. A small specimen showing the pectinated rhombs and structure of the body on the right side. The column is nearly entire, showing the articulations from base to summit with almost equal distinctness. The fingers are converged together above the summit of the body, giving it a pointed appearance.
8. The body somewhat broken, but preserving the fingers or pinnules to the length of three-fourths of an inch.
10. The summit of a specimen much crushed, but preserving a portion of the arms and fingers.
11. A single plate of the second range enlarged, showing the character of the surface, the pectinated rhomb, etc.
12. Enlargement of a portion of a plate, showing surface markings.
13. Enlargement of a part of an arm, with the fingers folded down upon the body of the fossil.
14, 15, 16. Bases of several columns, the two first showing slight evidences of rings, while the other appears quite solid.
17, 18. Enlargements of the surfaces of the solid bases of columns.
19. Transverse section at the top of the solid portion, showing the central canal and the rings within the exterior wall.
20, 21, 22. Lateral and sectional views and enlargement of a fragment of a large column, which exhibits characters very similar to the base of *Lepadocrinus*.
23. Diagram showing the structure of the body.

CRINOIDEÆ

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# PLATE 7 A.

Page

Fig. 1 – 5. SPHÆROCYSTITES MULTIFASCIATUS. 130

1. The left side of the specimen, natural size.
2. The summit, showing the origin and distribution of the arms, the upper pairs of pectinated rhombs, the ovarian and anal orifices, etc.
3. The base of the same specimen, showing the lower pectinated rhomb, the ramifications of the arms, and the cavity for the insertion of the column.
4. Diagram illustrating, as far as traced, the distribution of the arms upon the surface of the specimen figured.

4 *a*. An enlargement of one of the pectinated rhombs.

Fig. 5, 6, 7. ANOMALOCYSTITES CORNUTUS. 133

5. The convex side of an individual with a portion of the column attached.
6. The concave side, showing the two arching basal plates, the large central plate, and the superior range of plates.
7. A plate enlarged, showing the lamellar structure.

7 *a*. Diagram illustrating the structure of the body, and the relative position of the plates on the two sides.

Fig. 8, 9, 10. PROTASTER FORBESI. 134

8. The fossil, natural size.
9. Enlargement of the body and arms, with a restoration of the latter in outline beyond the limits of the body.
10. Enlargement of portions of an arm and tentacles, as seen from the lower side.

Fig. 11 & 13. DICTYOCRINUS SQUAMIFER. 135

11. The body, natural size.
13. Enlargement of surface, showing the form and arrangement of scales.

CYSTIDEÆ.

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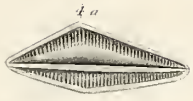
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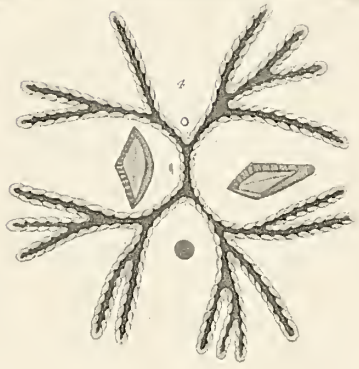
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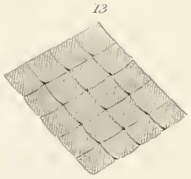
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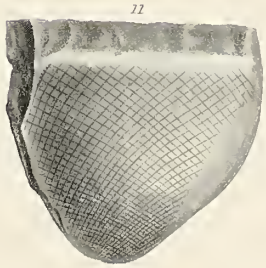
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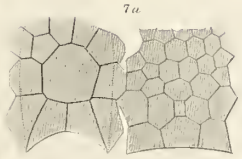
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P.B. Mueck, Del. John E. Gavit, Jr. Albany N.Y.

# PLATE 8.

Page

Fig. 1. DISCINA VANUXEMI. 162

1. Profile view

1 *a*. Dorsal view, showing the form of the shell.

1 *b*. Enlargement of surface, showing the radiating and concentric striæ (the latter are not strong enough in proportion to the others).

Fig. 2 – 16. STROPHODONTA VARISTRIATA. 180

2 – 6. Ventral valves, where the striæ are nearly equal or alternating in size.

7 & 8. Individuals presenting some variety in surface characters.

9. A young shell with salient hinge extremities, and strongly elevated striæ separated by fascicles of finer striæ between.

5 *a*. The upper figure with this number is an enlargement of the surface of fig. 9.

10. An individual with surface characters similar to the last, having the hinge extremities rounded, and the hinge line a little shorter than the greatest width of the shell below.

11. Interior of a ventral valve.

11 *a* (by error 12 *a*) above last figure. An enlargement of the area and crenulations.

12 & 12 *a*. Interior of ventral valve, and enlargement of area.

13. Interior of a ventral valve.

14 & 16. Casts of the interior of the ventral valve, where the shell is but partially exfoliated.

15 & 15 *a*. The interior of a ventral valve, and enlargement of a portion of the same.

16, at right hand of page. A portion of the surface much enlarged, showing the nearly equal striæ crossed by finer concentric lines.

Fig. 17 – 23. SPIRIFER VANUXEMI. 198

17, 18 & 19. Young individuals of this species.

20. Dorsal view of a medium-sized specimen.

20 *a*, *b*, *c*. Ventral, profile and front views of the preceding specimen.

21 & 23. Dorsal views of larger specimens.

22. Ventral view of another specimen of this species.

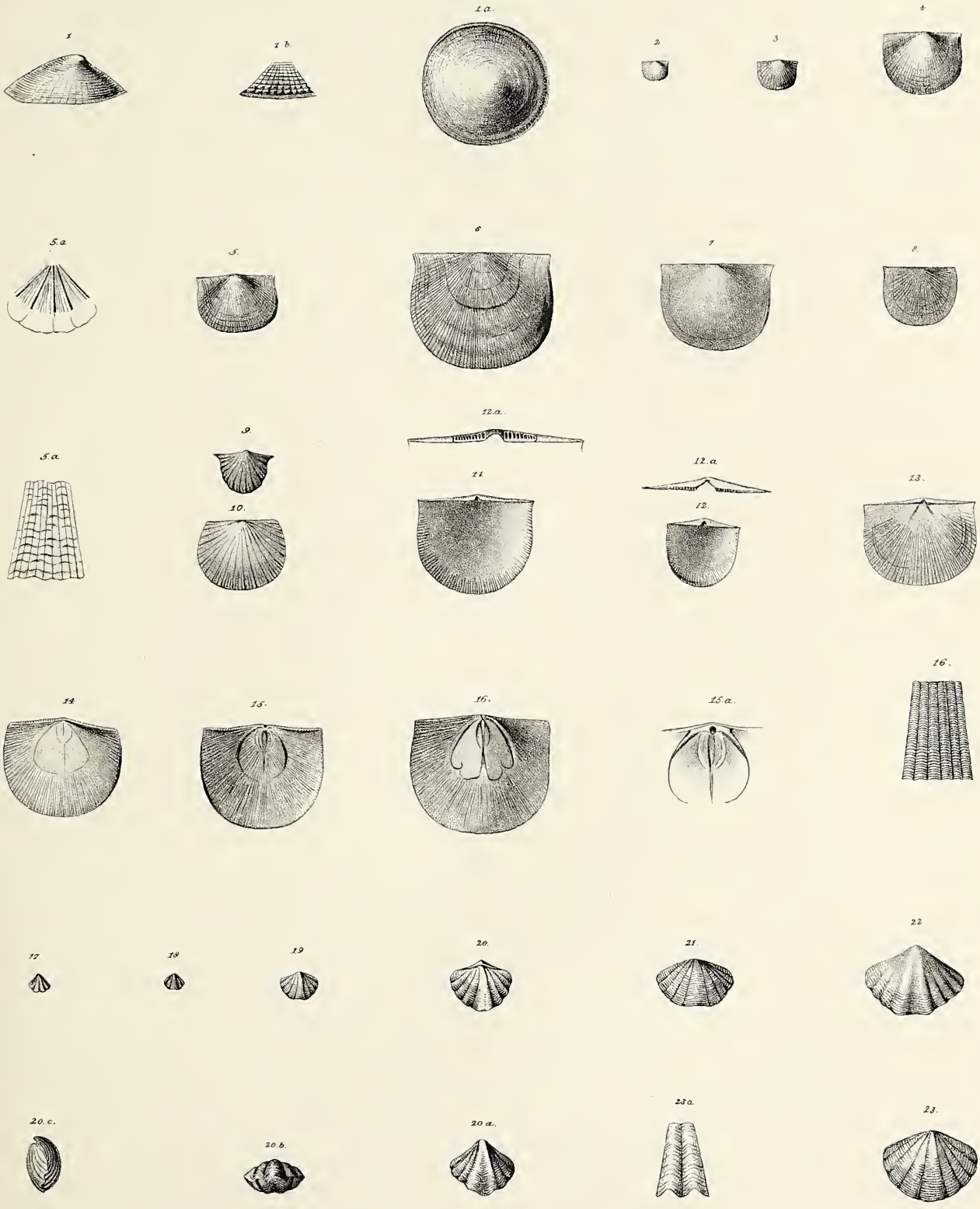
23 *a*. Enlargement of the surface, showing the concentric lamellæ.

# LOWER HELDERBERG GROUP.

(Tentaculite Limestone.)

(BRACHIOPODA)






On Stone by Swinton.

Lith of Rich.d H. Pease, Albany.

# PLATE 9.

Page

Fig. 1 & 2. LINGULA CENTRILINEATA. 155

1. A small individual of this species.

2. A larger specimen of the same.

Fig. 3, 4 & 5. LINGULA PERLATA. 156

4. An individual of medium size, preserving the two valves. The outer shell is partially exfoliated from the central part of the valve.

3. Profile of the same specimen, showing the convexity of the valves.

5. The lower part of a larger valve having the striæ more distant, very thin and sharply elevated, while towards the margin they are more closely arranged.

5 *a*. Enlargement of the concentric lamellæ.

Fig. 6 & 8. LINGULA RECTILATERA. 156

6. An individual of medium size.

8. A large individual of the same species.

Fig. 7, 9 & 11. LINGULA SPATHATA. 157

9. A large individual having the upper part of the shell broken off.

7 & 11. Two views of a specimen having the base broken off. The convexity of the two valves is more than one-third the greatest width of the shell.

Fig. 10. LINGULA SPATIOSA. 158

10. The shell, natural size.

10 *a*. A portion of the surface enlarged.

Fig. 13 – 15, & 16 *a*. DISCINA DISCUS. 195

13. The lower valve partially exfoliated, and showing radiating striæ.

14. Interior of the lower or ventral valve, showing the lamellose structure and radiating striæ. [ In the figure the striæ are too regular, and should be represented as bifurcating towards the margin.]

15. A lower valve (with the margins slightly exfoliated ), preserving nearly entire the concentric lamellose striæ.

16 *a* ( Error for 15 *a*). Profile of the lower valve, showing the convexity.

15 *b*. Enlargement of the lamellose striæ.

15 *a* ( Error for 14 *a*). Enlargement of the radiating striæ of fig. 14.

Fig. 12, 16 & 17. DISCINA CONRADI. 161

12 Exterior view of the lower valve ( improperly represented without the foramen).

12 *a*. Enlargement of the surface of the same.

16. Dorsal valve having the outer shell exfoliated, and showing radiating striæ which bifurcate towards the margins.

17. Enlargement of the striæ.

17 *a*. Profile view of the dorsal valve.

# LOWER HELDERBERG GROUP.

(Delthyris Shaly Limestone.)

(BRACHIOPODA.)

On Stone by Swinton.

Lith. of R.H. Pease, Albany.

# PLATE 10.

Page

Fig. 1 – 22. ORTHIS OBLATA. 162

1, 2, 3. Individuals showing a gradation of size, from the smallest recognized specimens of the species to the half-grown forms.

4, 5, 6. Individuals illustrating a mare elongate and more gibbous form, which seems scarcely separable from the others, but is still never found of larger size than fig. 6.

7, 8, 9, 10. Individuals of larger dimensions; the last being a full-grown specimen of the broad variety, one and three-fourths inches wide by one and a quarter long.

11, 12, 13, 14. The interior of the ventral valves of several specimens, showing some variety in the vascular impressions.

15, 16. The interior of the dorsal valves of the more elongate and gibbous forms.

17. The interior of the dorsal valve of the broad variety, having the dimensions of an inch and a half by an inch and a quarter.

19, 20. Casts of the ventral valve, showing the muscular and vascular impressions.

21, 22. Casts of the dorsal valve, with impressions of the cardinal and brachial processes.

# LOWER HELDERBERG GROUP.

("Delthyris Shaly Limestone.")

(BRACHIOPODA.)

Swinton, del. et lith.

# PLATE 10 A.

Page

Fig. 1, 2, 3. ORTHIS CONCINNA. 172

1 *a*, *b*. Ventral and dorsal views of a small specimen.

2 *a*, *b*, *c*, *d*. Ventral, dorsal, profile, and front views of a large individual.

3 *a*, *b*. Interiors of the ventral and dorsal valves.

3 *c*. Cardinal view of the dorsal valve.

Fig. 4, 5 & 6. ORTHIS OBLATA, *var.* EMARGINATA. 164

4 *a*, *b*, *c*, *d*. Illustrations of the form and characters of this variety.

5 *a*, *b*. Interior of the two valves.

6 *a*, *b*. Cast of the ventral and dorsal valve.

Fig. 7 – 12. ORTHIS DISCUS. 165

7, 8 *a*, *b*. Individuals of the smaller known forms of this species.

9, 10 *a*, *b*. Individuals of larger size.

10 *c*, *d*. Cardinal and front views of the same.

11. Interior of the ventral valve.

12. Cast of a dorsal valve, probably of this species.

Fig. 13 *a*, *b*. ORTHIS DEFORMIS. 174

13 *a*. Dorsal view, showing the extent of area, the broken beak, etc.

13 *b*. Ventral valve of the same, showing the abrupt contraction of the striæ towards the beak, which is broken off below the point of attachment.

Fig. 13, 14, 15, 16. SKENIDIUM (ORTHIS) INSIGNIS. 173

13. Dorsal view, natural size.

14 & 15. Dorsal valve and area enlarged.

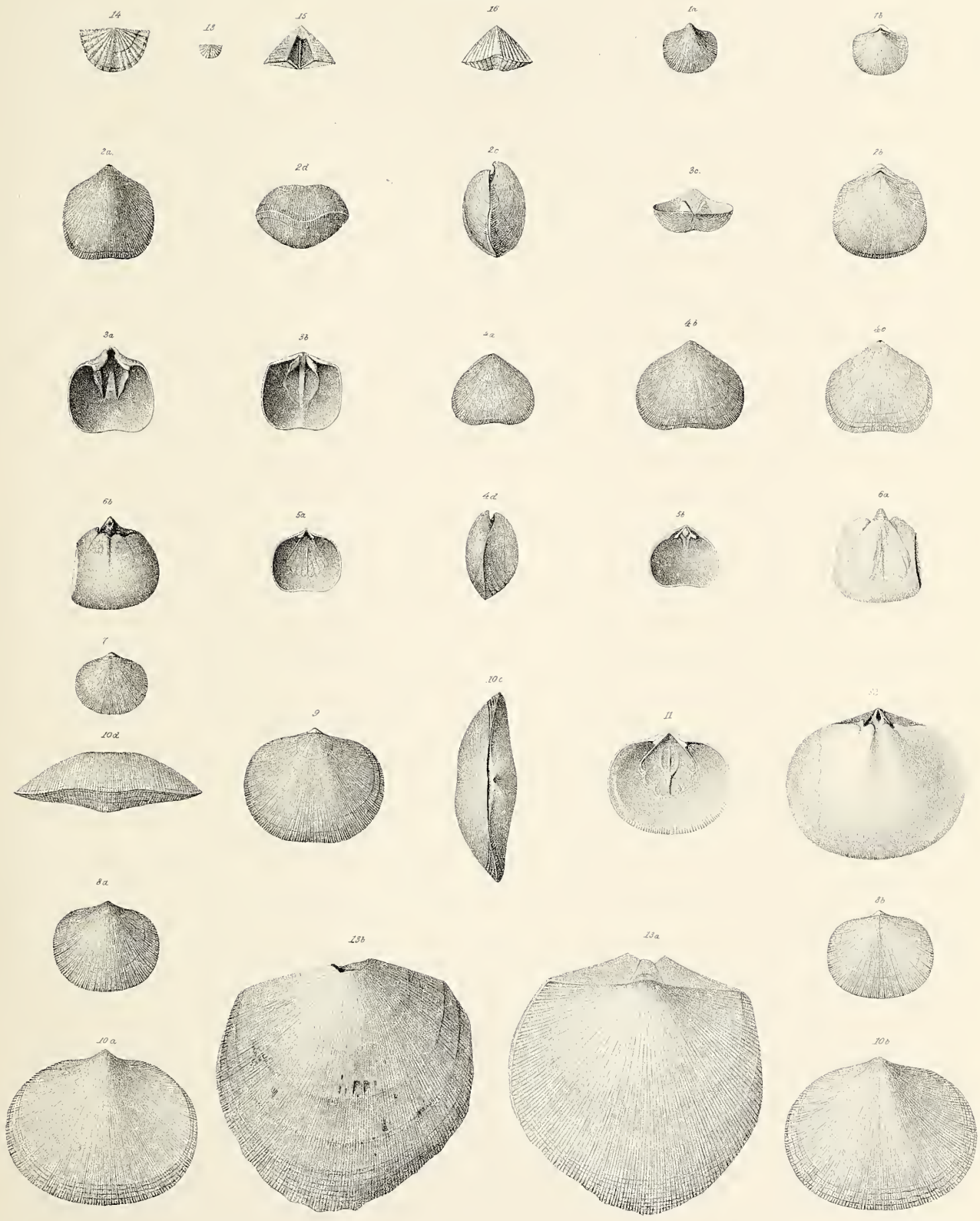
16. Front view of the same enlarged.

# LOWER HELDERBERG GROUP.



(Shaly Limestone)

(BRACHIOPODA.)




R.P.Whitfield, del.

Swinton, lith.

# PLATE 11.

Page

Fig. 1 – 6. ORTHIS TUBULOSTRIATA. 166

1 – 3. Young individuals of this species.

4 & 6. Larger individuals. The two figures on each side of the central figure 6 are enlargements of striæ; one without the tubular openings, the other showing this character. The righthand figure of the line shows the cardinal and brachial processes of the dorsal valve, and the lefthand figure is the profile of fig. 6.

Fig. 7 – 14. ORTHIS EMINENS. 167

7 – 10. Young individuals.

12. Three views of a specimen of medium size.

13. Three views of a larger individual.

The specimens 12 and 13 are well-marked and characteristic forms of this species.

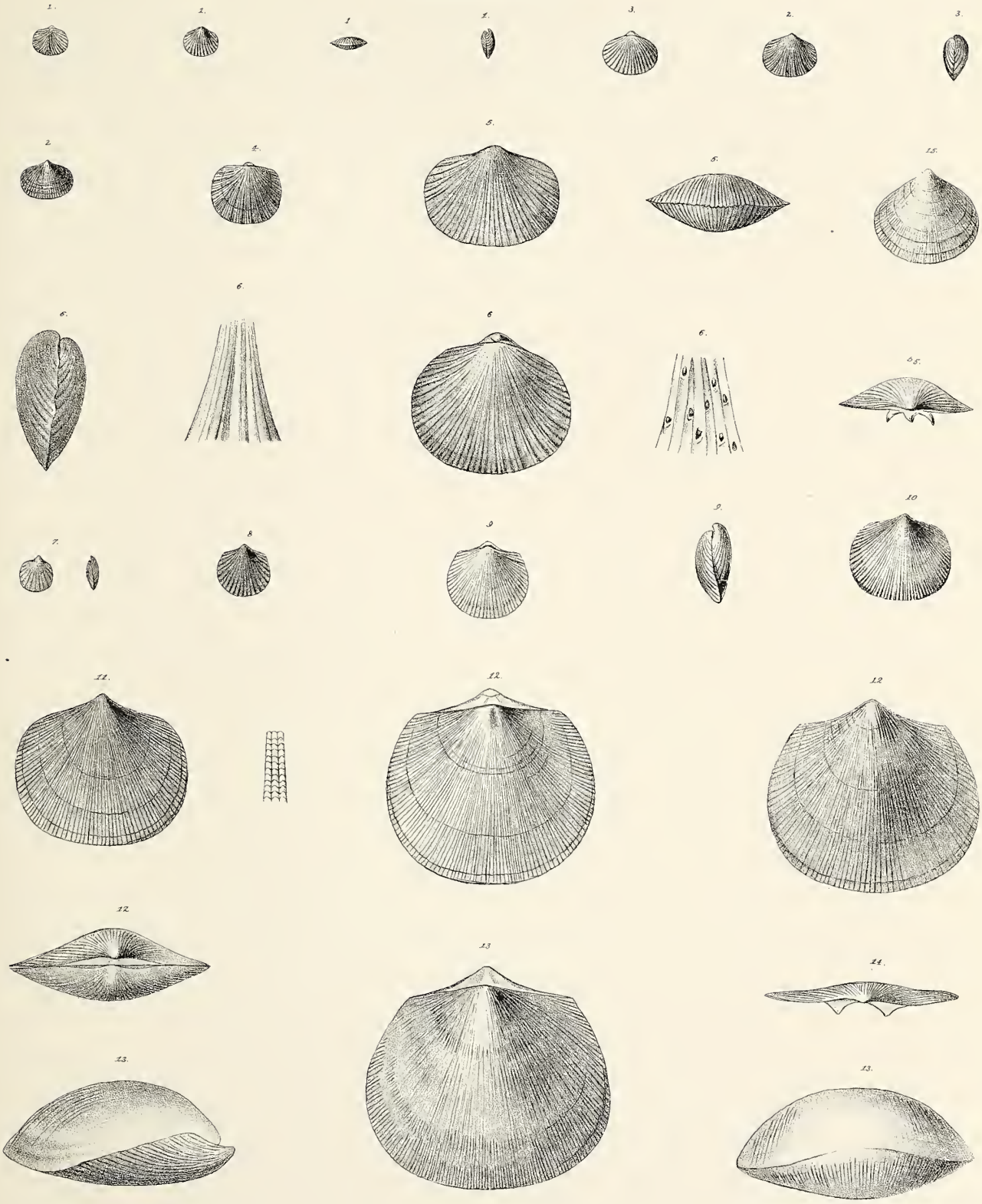
11 & 14 are referred with doubt to this species.

# LOWER HELDERBERG GROUP.

( Delthyris Shaly Limestone. )

(BRACHIOPODA.)





On Stone by Swinton.

Lith of Richd H. Pease, Albany.

# PLATE 12.

Page

Fig. 1 – 6. ORTHIS PLANOCONVEXA. 168

1 *a*, *b*. Views of small individuals of this species, from Maryland.

2 *a*, *b*, *c*, *d*, & 3. Larger individuals, from New-York, showing the ventral and dorsal sides, profile and area.

4. The interior of the dorsal valve of a smaller individual.

5. Interior of the ventral valve.

6 *a*, *b*. Dorsal and ventral valves of a cast of the same species.

Fig. 7 – 21. ORTHIS SUBCARINATA. 169

7, 8 *a*, *b*, *c*. Views of young individuals.

9, 10. Views of individuals which have a subquadrangular outline, with the dorsal valve deeply depressed in the centre and much elevated on each side, and the front margin strongly sinuate.

11, 12. Interior of the valves of the preceding specimens.

13. 14, 15. Individuals showing gradation in size, and some slight modification in proportions.

16, 17. Full-grown individuals of this species.

18. Interior of the ventral valve.

19 *a*, *b*. Interior of the dorsal valve, showing the muscular and vascular impressions, and cardinal view of the same.

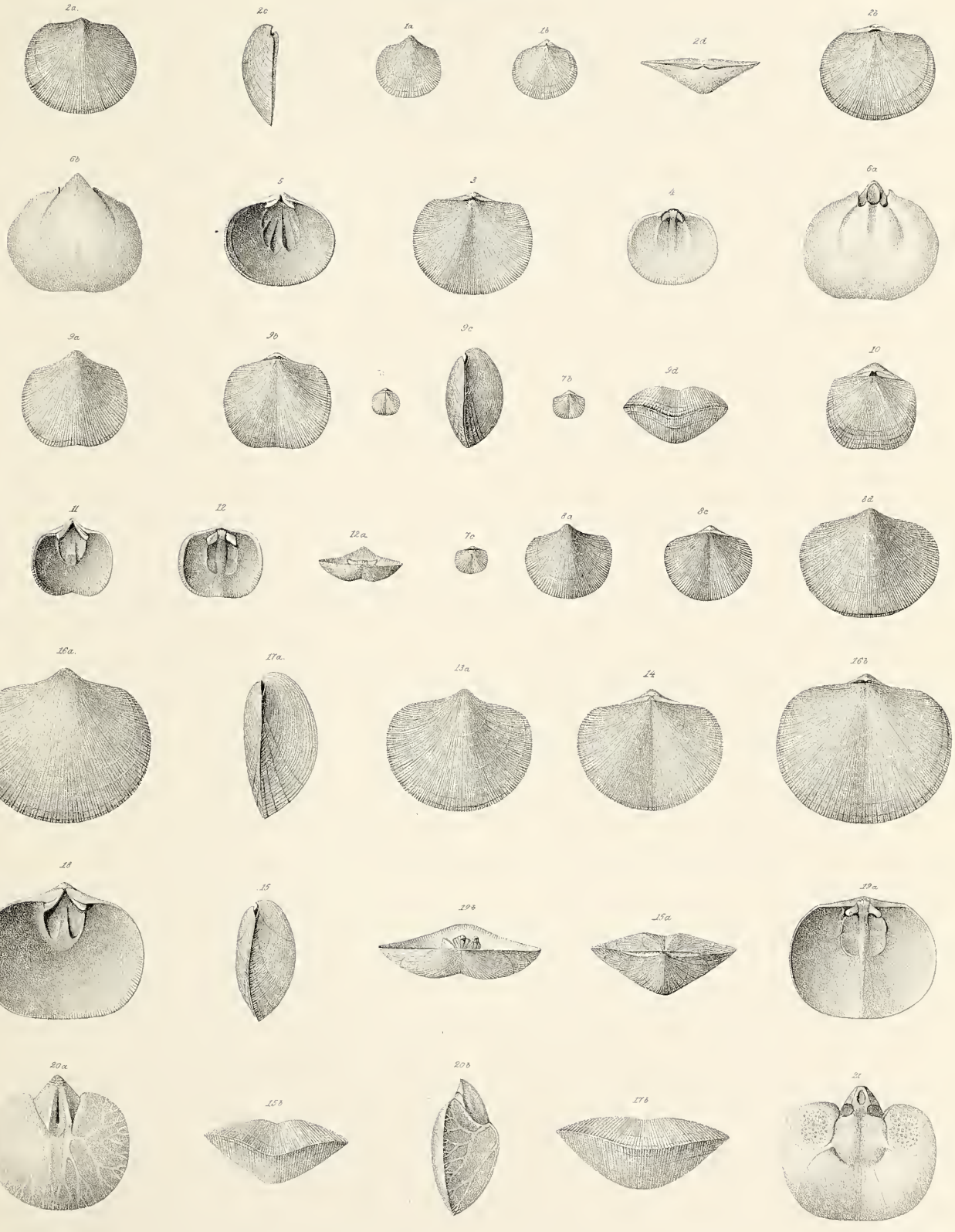
20, 21 *a*, *b*, *c*. Ventral, dorsal, and profile views of casts, the vascular impressions, etc.

# LOWER HELDERBERG GROUP.



(Shaly Limestone)

(BRACHIOPODA.)




R.P. Whitfield, del.

Swinton, lith.

# PLATE 13.

Page

Fig. 4 – 12. ORTHIS PERELEGANS. 171

4 *a*, *b*, *c*, etc. Views of small individuals, which appear to be the young of this species, but may prove distinct.

5 *a*, *b*, *c*. Small individuals, authentic forms of this species.

6 *a*, *b*, *c*. Specimens intermediate in size.

7 *a*, *b*, *c*, *d* & *e*. Specimens of the ordinary size.

8. A large individual of this species.

9 *a*, *b*. Interiors of the ventral valve.

10 *a*, *b*, *c*. Interiors of the dorsal valve.

10 *d*. Profile showing the comparative elevation of the cardinal and brachial processes.

11 *a*, *b*, *c*. Casts of the ventral valve.

12 *a*, *b*. Casts of the dorsal valve.

Fig. 16. ORTHIS PEDUNCULARIS. 174

16 *a*. Exterior of an imperfect valve.

16 *b*. Interior of the same.

It is possible that this one may prove identical with *O. eminens*.

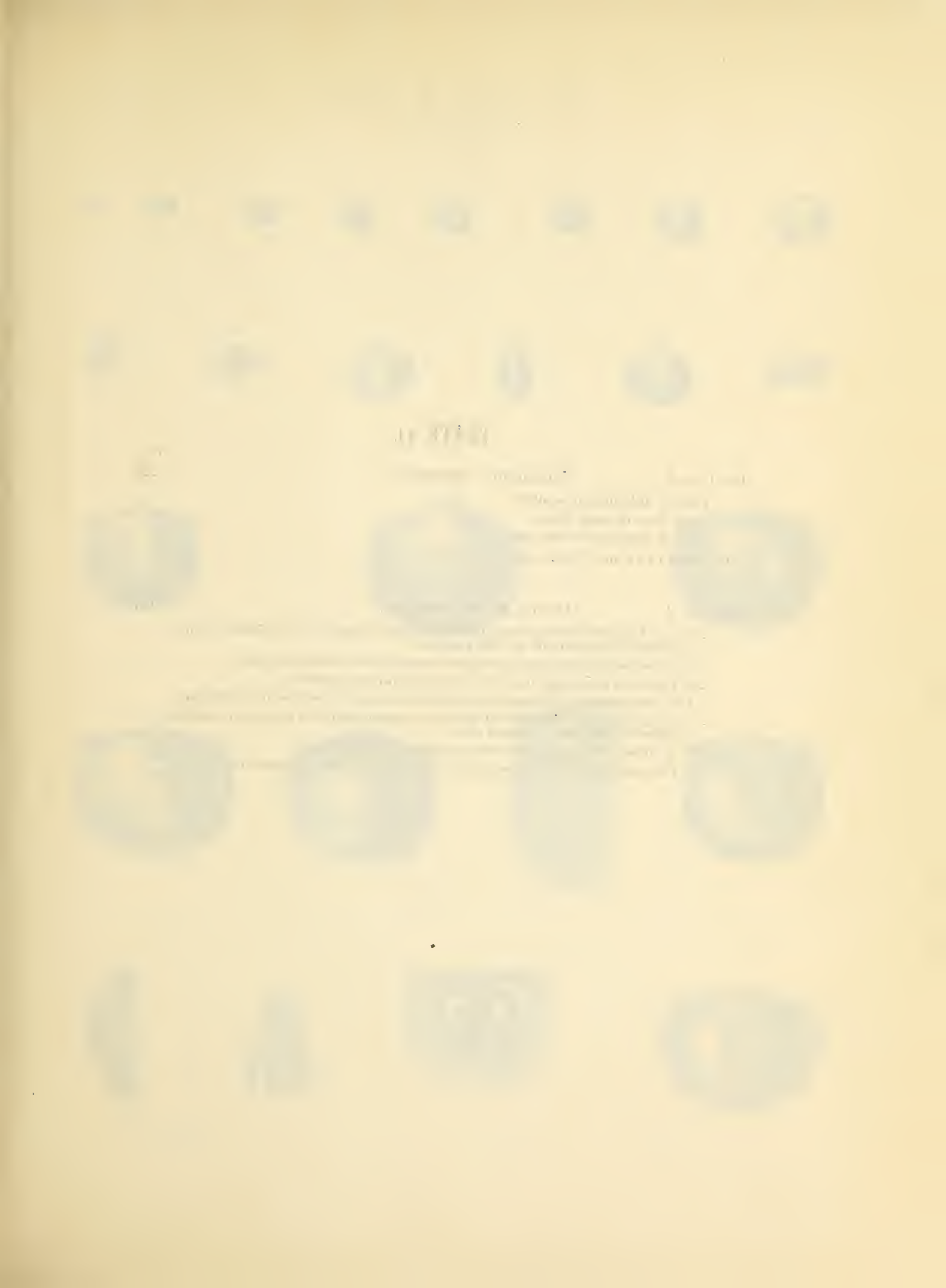
# LOWER HELDERBERG GROUP.

("Delthyris Shaly Limestone.")

(BRACHIOPODA.)

R.P. Whitfield, del

Swinton, lith.



# PLATE 14.

Page

Fig. 1 *a* – *h*. NUCLEOSPIRA VENTRICOSA. 220

1 *a*, *b*, *c*. Individuals of small size.

1 *d*, *e*. Casts of larger forms.

1 *f*, *g*, *h*. Specimens of large size.

The figures 1 *i* – *o* are of MERISTELLA. See *M. bella*.

Fig. 2 *a* – *l*. ORTHIS STROPHOMENOIDES. 177

2 *a*, *b*, *c*. The ventral valves of several specimens which are more or less exfoliated, so that the surface characters are not fully preserved.

2 *d*, *e*. Casts of the ventral valve, showing the muscular and vascular impressions.

2 *f*. Profile of a dorsal valve from which the shell is partially exfoliated.

2 *g*, *h*. Two specimens of the dorsal valve, showing the muscular and vascular impressions.

2 *i*. Enlargement of the muscular and vascular impressions, cavities of cardinal and brachial processes, etc. of part of a dorsal valve.

2 *k*. A farther enlargement of one side of the cast of a dorsal valve.

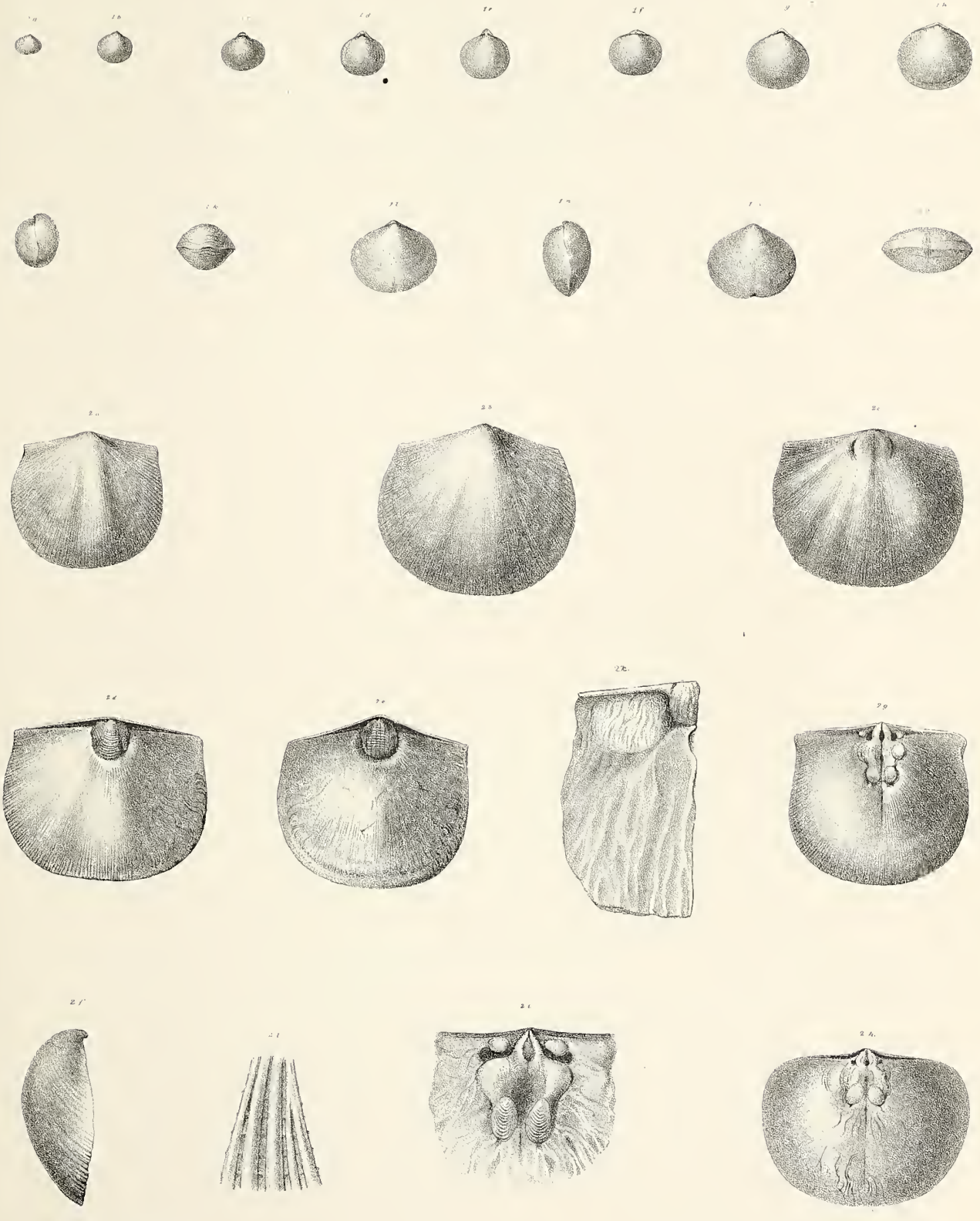
2 *l*. Enlargement of the striæ, showing in the depressions some fine concentric striæ.

# LOWER HELDERBERG GROUP

Delthyris Shaly Limestone

(BRACHIOPODA)





On Stone by Swinton.

Lith of Rich[d] H Pease, Albany

# PLATE 15.

Page

Fig. 1. ORTHIS ASSIMILIS. 175

1 *a* – *d*. Ventral, dorsal, profile, and front views of a small specimen.

1 *e*. Cast of the ventral valve of a larger individual, showing the vascular and muscular impressions.

Fig. 2. ORTHIS MULTISTRIATA. 176

2 *a*, *b*, *c*. Dorsal, ventral and profile views of a very symmetrical specimen of medium size.

2 *d*, *e*. Front and profile views of a larger individual.

2 *f*. Cardinal view.

2 *g*, *h*. *i*. Dorsal, ventral, and profile views of a large individual.

2 *k*. Cast of ventral valve.

2 *l*. Cast of dorsal valve of 2 *k*.

2 *m*, *n*. Front and profile view of the preceding specimen.

2 *o*, *p*. Casts of dorsal valves, showing muscular and vascular impressions.

2 *r*. Cast of ventral valve of a full-grown individual.

2 *s*, *t*. Front and profile view of the preceding.

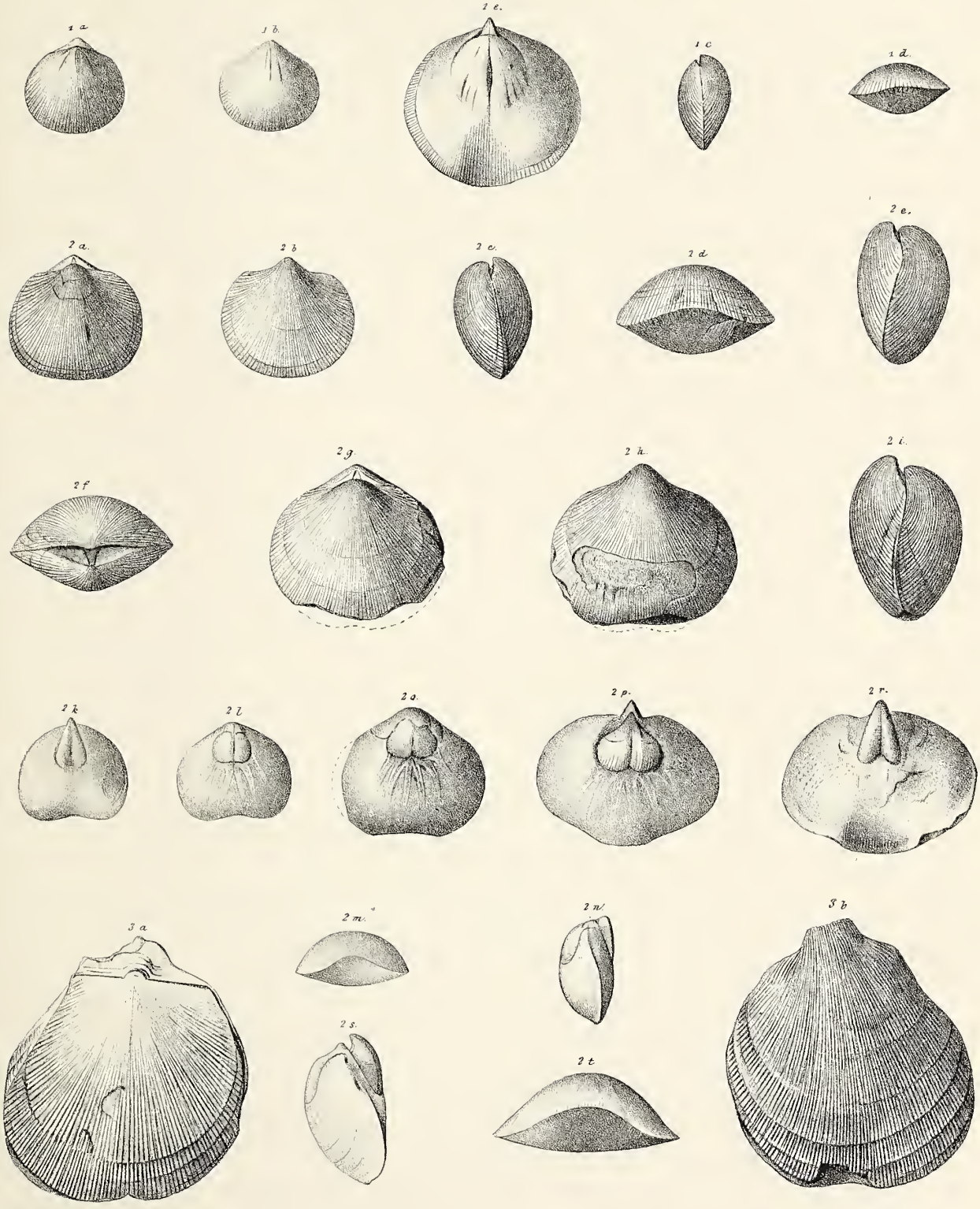
Fig. 3. ORTHIS DEFORMIS. 174

3 *a*. View of the dorsal valve and area of the ventral valve.

3 *b*. Ventral valve of the same specimen, showing the contracted and distorted beak.

upper Pentamerus Limestone.

BRACHIOPODA




Lith of E. Palmer, N.Y.

Sculpt by Pomeroy

# PLATE 16.

Page

Fig. 1 – 8, & 16. STROPHODONTA VARISTRIATA. 180

1 *a*. A young individual slightly convex in the centre towards the beak, and flat at the sides.

1 *b*. Profile showing the outline from beak to base.

1 *c*. Enlargement showing the stronger elevated striæ with the finer intermediate ones, and the commencement of other stronger ones in the midst of the finer striæ.

2. An individual of the same character, having a greater convexity near the beak.

3 *a*. A similar form where the beak or umbo is not elevated, and the whole shell nearly flat.

3 *b*. Profile showing the curvature of the shell near the base.

3 *c*. Enlargement of striæ, showing the fasciculate character.

3 *d*. A farther enlargement of the surface, showing the concentric striæ.

4 *a*. An individual having the character of *S. rectilateris*.

4 *b*. Profile of the same.

4 *c*. Profile of an individual having similar characters of surface, with a greater convexity.

4 *d*. Enlargement of striæ of 4 *a*, showing the alternating size and frequent bifurcation.

5 *a*. The *S. impressa* of CONRAD, natural size.

5 *b*. Profile of same, showing the abrupt bending or geniculation towards the base.

5 *c*. Enlargement of striæ, showing the coarser ones with intermediate fascicles of smaller ones.

5 *d*. A portion of the surface enlarged where partially exfoliated on an impression of the exterior surface, showing the impressed lines made by the stronger striæ; which is merely a reverse of fig. 5 *d*, or of fig. 3*c* & 3 *d*.

6. An individual with coarser striæ than usual, the surface partially exfoliated, and profile of same.

6 *a*. The striæ enlarged, showing the punctate character of the surface when partially exfoliated.

7 *a*, *b*. Illustrations of the surface of "*Leptæna indenta*".

8 *a*, *c*. Illustration of the hinge-line, area, vascular impression, etc. of the ventral valve, showing the apparent foramen, which is due to fracture, and has not the regular triangular form of *Strophomena*.

8 *b*. Enlargement of hinge-line, teeth, etc. of the dorsal valve.

16. *S. varistriata*, var. *arata*.

Fig. 9 – 12. STROPHODONTA PLANULATA. 184

9 *a*. An individual of medium size, with the hinge-extremities salient.

9 *b*. Profile view of the same.

9 *c*. Enlargement of the surface, showing the character of the radiating and concentric striæ.

10. An individual showing some faint concentric undulations.

11 *a*. A large individual nearly entire, having the exterior surface slightly weathered, and showing the puncta along the striæ.

11 *b*. Profile of the preceding specimen.

11 *c*. Enlargement of the surface, showing the character of the striæ and arrangement of the puncta.

12. An individual in which the shell is partially removed, showing obscurely the form of the vascular impressions.

Fig. 13 – 15. STROPHOMENA CONRADI. 194

13 *a*. The ventral valve.

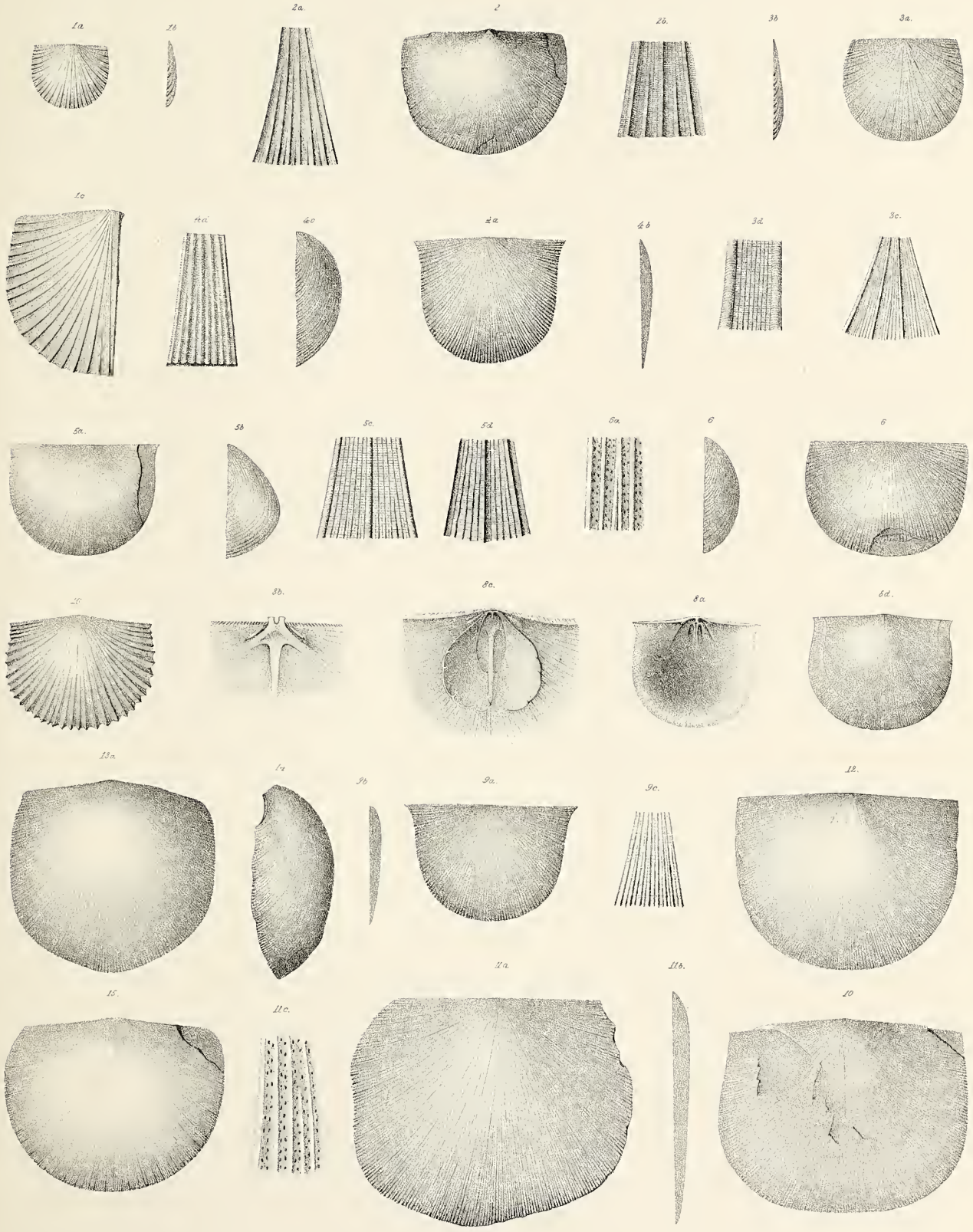
14. Profile view of the same.

15. Ventral view of another individual.

# LOWER HELDERBERG GROUP.



(BRACHIOPODA.)




Swinton, lith.

# PLATE 17.

Page

Fig. 1 & 2. STROPHOMENA WOOLWORTHANA. 192

1 *a*. Ventral valve of an individual of medium size.

1 *b*. Dorsal valve of a larger individual, showing the area of the opposite valve and the closed foramen.

1 *c*. Ventral valve of the same.

1 *d*. Profile view of the same.

1 *e*. Ventral valve of a large individual.

1 *f*. View of area of 1 *e*.

1 *g*. Cardinal view of an entire individual, showing the area of the ventral valve, and the convexity of the dorsal valve.

1 *h*, *i*, *k*, *l*. Interior of the ventral valves of several individuals of different size, and showing some variety in form of the muscular impressions.

1 *m*. A cast of the ventral valve.

1 *n*. *o*. Interior of dorsal valves, showing the cardinal processes, with some difference in the strength of the muscular impressions and proportional length of the hinge-line.

1 *p*, *r*. Cardinal view of ventral valve, showing the cardinal processes and the same enlarged.

1 *s*, *t*. Enlargement and profile of the striæ.

2 *a*, *b*, *c*. Casts of the interior of the dorsal valves of several individuals.

# LOWER HELDERBERG GROUP.

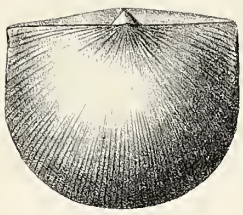
Delthyris Shaly Limestone.

(BRACHIOPODA.)

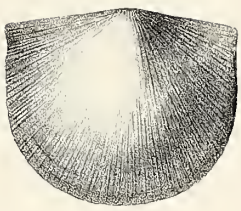


1a.

1b.



1c.



1d.

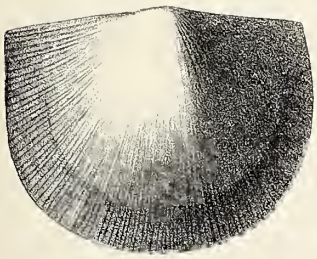
1f.

1g.

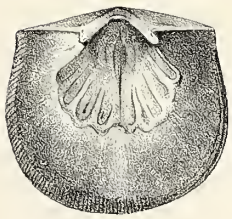
1r.

1p.

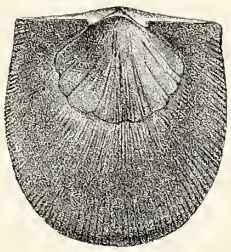
1e.



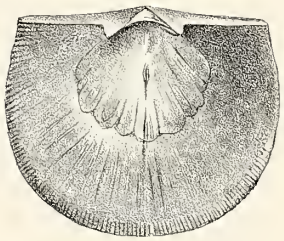
1k.



1i.



1h.



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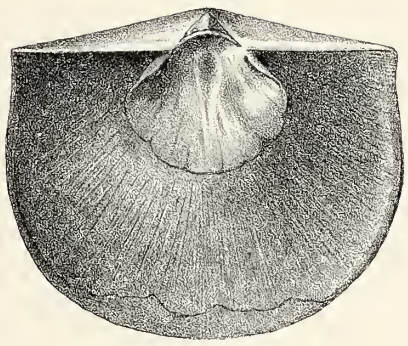

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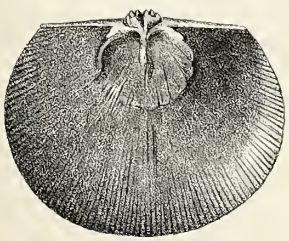
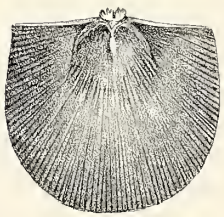
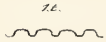


1o.

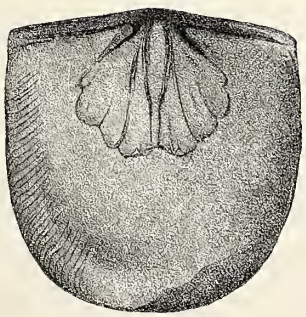


1s.

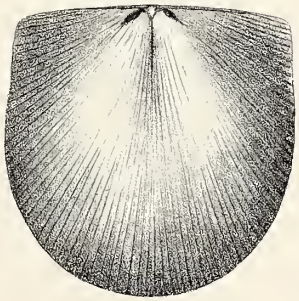
1t.



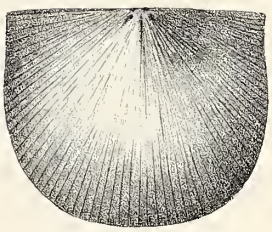
1m.



2b.



2c.



2a.

On Stone by Swinton.

Lith. of Rich^d. H. Pease, Albany

# PLATE 18.

Page

Fig. 1 *a* – *i*. STROPHODONTA VARISTRIATA, *var.* ARATA. 183

1 *a* – *d*. Ventral valves of several specimens where the shell is more or less exfoliated, the last one being almost free from adhering shell.

1 *e*, *f*, *g*. Profile views, showing the convexity of several individuals.

1 *h*. The surface showing the ridges and striæ.

1 *i*. A portion of a cast of the interior, which preserves the ridges, but shows no intermediate striæ.

Fig. 2. LEPTÆNA CONCAVA. 197

2 *a*, *b*. Ventral and dorsal views of a specimen of this species.

2 *c*, *d*. Profile and cardinal views.

2 *e*. Enlargement of area, foramen, etc.

2 *f*. Enlargement of the surface, showing the finer longitudinal and concentric striæ.

Fig. 3. STROPHOMENA RADIATA. 193

3 *a*. The ventral valve.

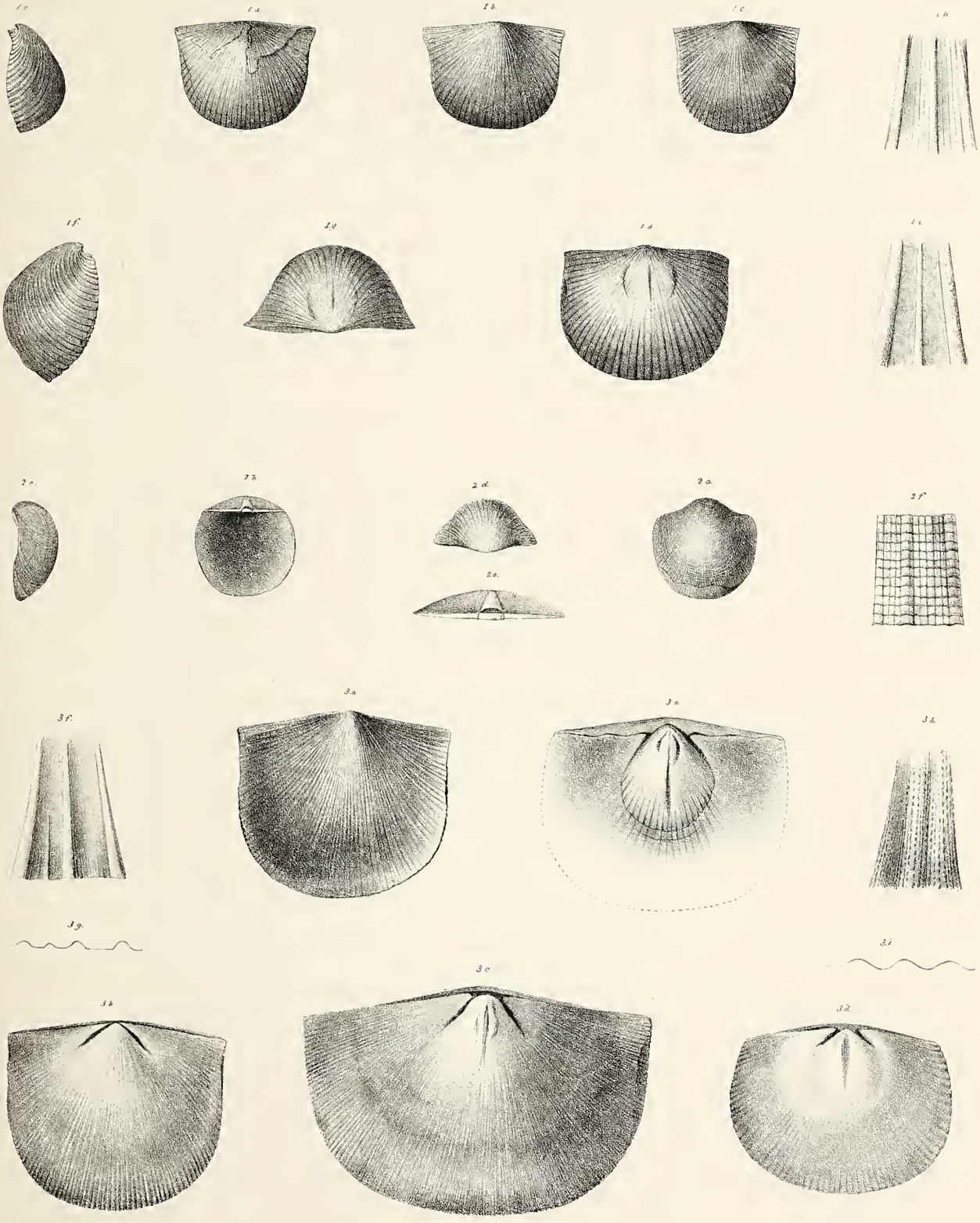
3 *b*, *c*, *d*, *e*. Casts of specimens of this species.

# LOWER HELDERBERG GROUP.

Delthyris Shaly Limestone.

(BRACHIOPODA.)






On Stone by Swinton

Lith of Rich^d H. Pease, Albany

# PLATE 19.

Page

Fig. 1 *a* – *y*. STROPHOMENA RUGOSA. 195

1 *a* – *i*. Figures illustrating the usual characters presented by shells of this species.

1 *k* (by error marked 1 *s*). Profile showing the great extent of the deflected portion of the shell. Between this one and 1 *b* †, there are every possible gradation.

2 & 2 †. Specimens which are slightly curved, and showing a larger number of corrugations than usual, which extend nearly to the base of the shell.

1 *l*, *m*, *n*. Interiors of dorsal valves, showing some variety of characters.

1 *l* †. Enlargement of the striæ on the interior.

1 *o*, *p*, *q*. Casts or moulds left in the stone by the dorsal valves of several individuals.

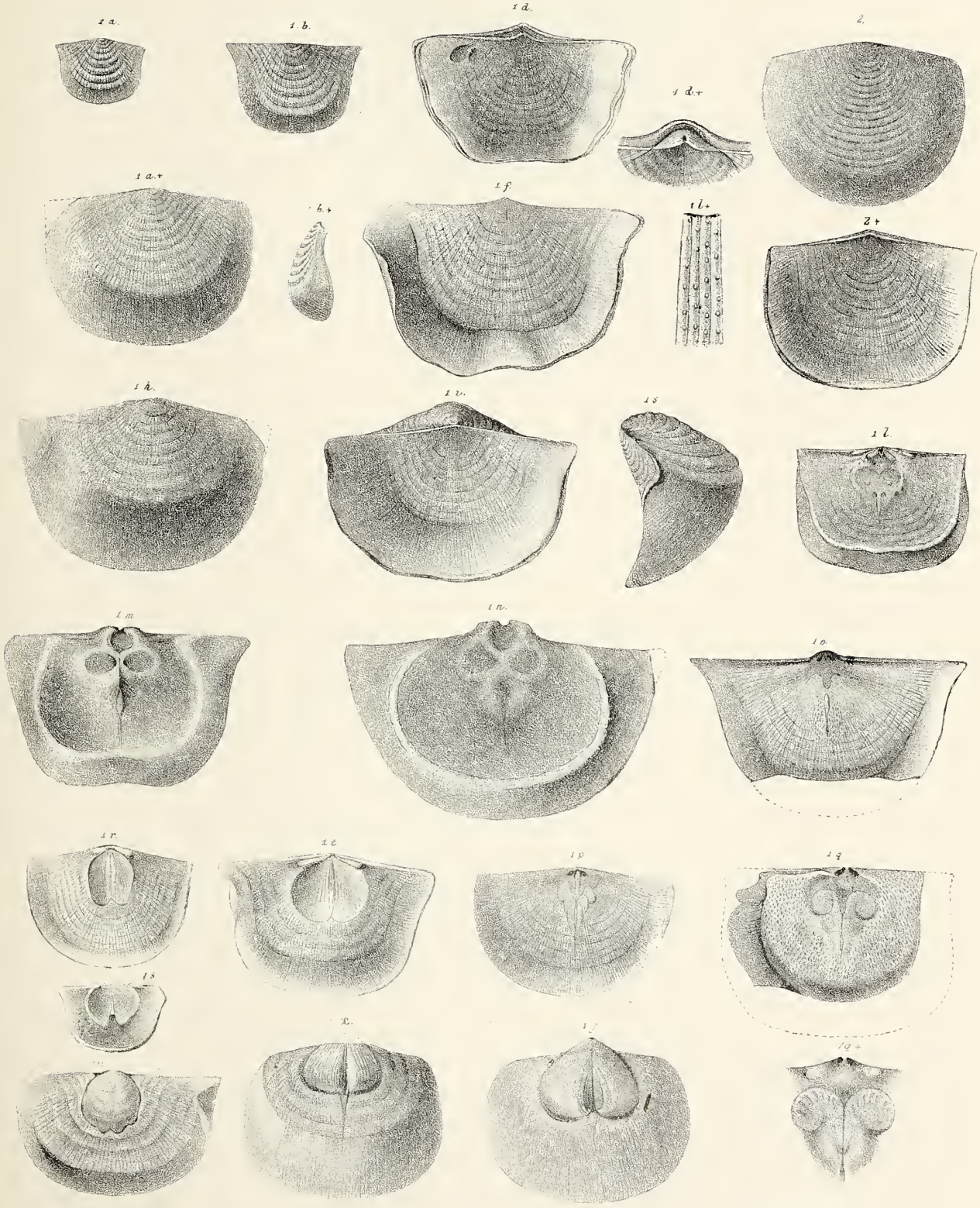
1 *q* †. Enlargement of the muscular imprints, etc.

1 *r*, *s*, *t*. Interior of the ventral valve of several individuals.

1 *u*, *x*, *y*. Casts of the interior of the ventral valve, 1 *u* still retaining a portion of the shell.

Shaly Limestone

BRACHIOPODA




On Stone by. Swinton.

Lith of Richd H. Pease Albany

# PLATE 20.

Page

Fig. 1, 2 & 3. STROPHODONTA HEADLEYANA. 185

1 *a*. Interior of the ventral valve, where the surface is marked by strong rounded striæ, and the muscular area striate. The hinge, along its line of junction with the opposite valve, presents a linear groove from the termination of the crenulations to the cardinal extremities : crenulations extending little more than one-third the length of the hinge-line on either side of the centre.

1 *b*. Enlargement of a portion of the hinge-line and area of 1 *a*.

2 *a*, *b*. Interior of the ventral valve of two specimens which present some variation in the form of the muscular impressions.

2 *c*. Enlargement of the papillose interior surface.

2 *e*. Enlargement of the cast of the muscular area.

2 *d*. Cast of a ventral valve, showing the narrow callosity which fills the foramen.

2 *f*. Enlargement of the punctate casts of striæ.

3 *a*. Exterior of a ventral valve, showing the peculiar interrupted striation.

3 *b*. Profile showing the concavity of the ventral valve.

3 *c*. Enlargement of a portion of the striæ.

3 *d*. Interior of a valve having similar characters to 3 *a*, but more deeply concave.

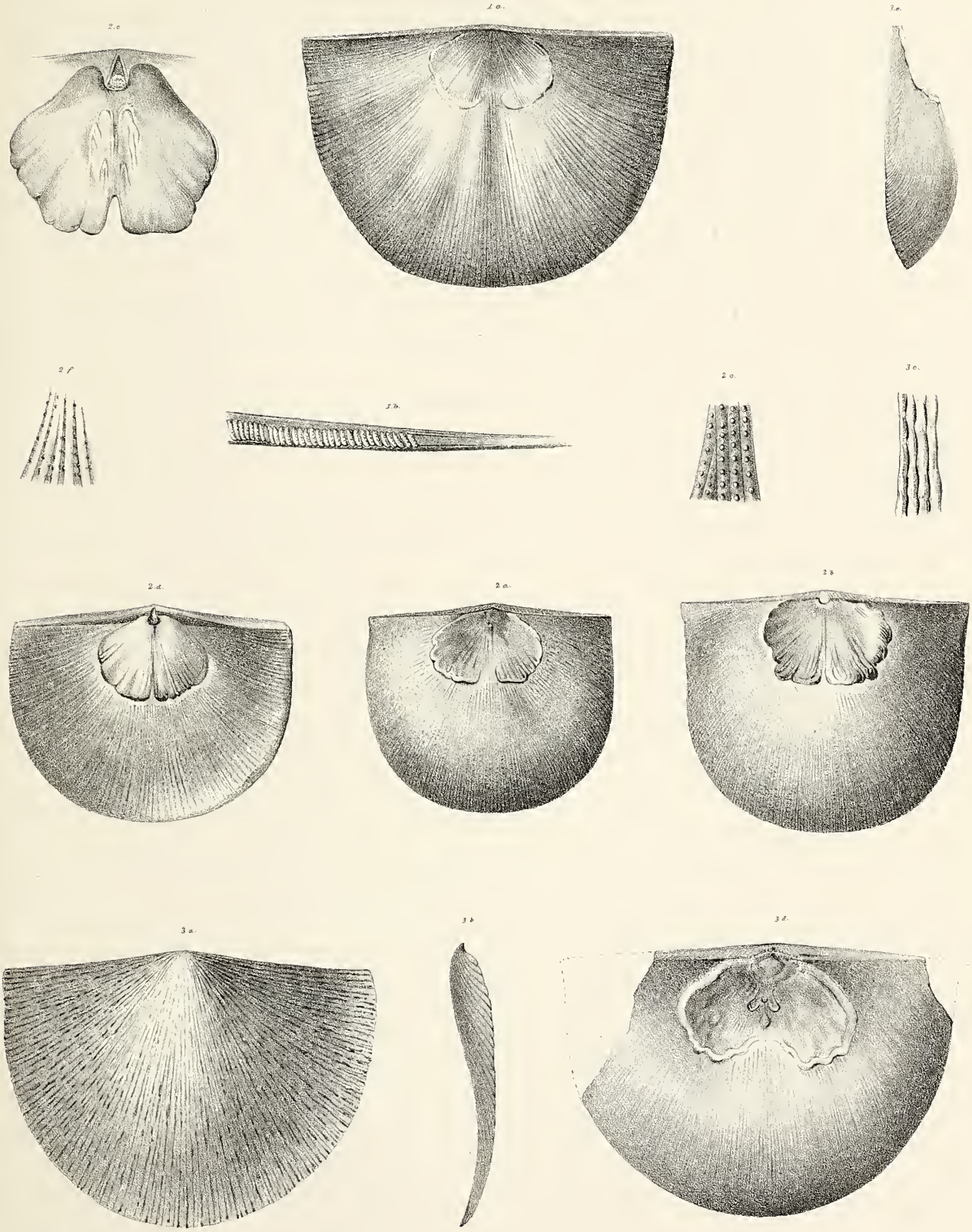
3 *e*. Profile of 2 *b*, showing the convexity of the interior of the valve.

# LOWER HELDERBERG GROUP.

Delthyris Shaly Limestone.

(BRACHIOPODA.)






On Stone by Swinton.

Lith of Rich^d H Pease, Albany.

# PLATE 21.

Page

Fig. 1, 2 & 3. STROPHODONTA CAVUMBONA. 187

1 *a*, *c*. Ventral and dorsal valves of young specimens.

1 *b*, *d*. The striæ in profile, and the surface enlarged.

1 *e*. A partial cast of the ventral valve.

1 *f*. The dorsal valve partially exfoliated, and showing the crenulations along the hinge-line: the striæ are rounded and frequently bifurcating.

1 *g*. The punctate surface shown where the shell is exfoliated.

1 *h*. Profile of the rounded striæ of 1 *f*.

2 *a*. The dorsal valve of a well-preserved specimen.

2 *c*. Profile of striæ, showing the elevations and flat surfaces between them.

3. A ventral valve, probably of this species.

Fig. 4. STROPHODONTA PUNCTULIFERA. 188

4 *a*. A cast of this species.

4 *b*. Enlargement of the striæ, showing the punctate surface.

Fig. 5, 6 & 7. STROPHODONTA LEAVENWORTHANA. 189

5 *a*. The dorsal valve, showing obscurely the concentric wrinkles and the punctate surface where the shell is exfoliated.

6 *a*. Interior of the ventral valve.

6 *b*. Profile of the preceding.

6 *c*. Enlargement of the crenulations of the hinge-line of 6 *a*.

7 *a*. Interior of a ventral valve.

7 *b*. Profile of the same.

Fig. 8 & 9. STROPHODONTA RADIATA. 193

8 *a*. A figure of the original specimen, with the shell in part exfoliated.

8 *b*. Enlargement of the radiating and concentric striæ.

9 *a*. A smaller individual from the same locality.

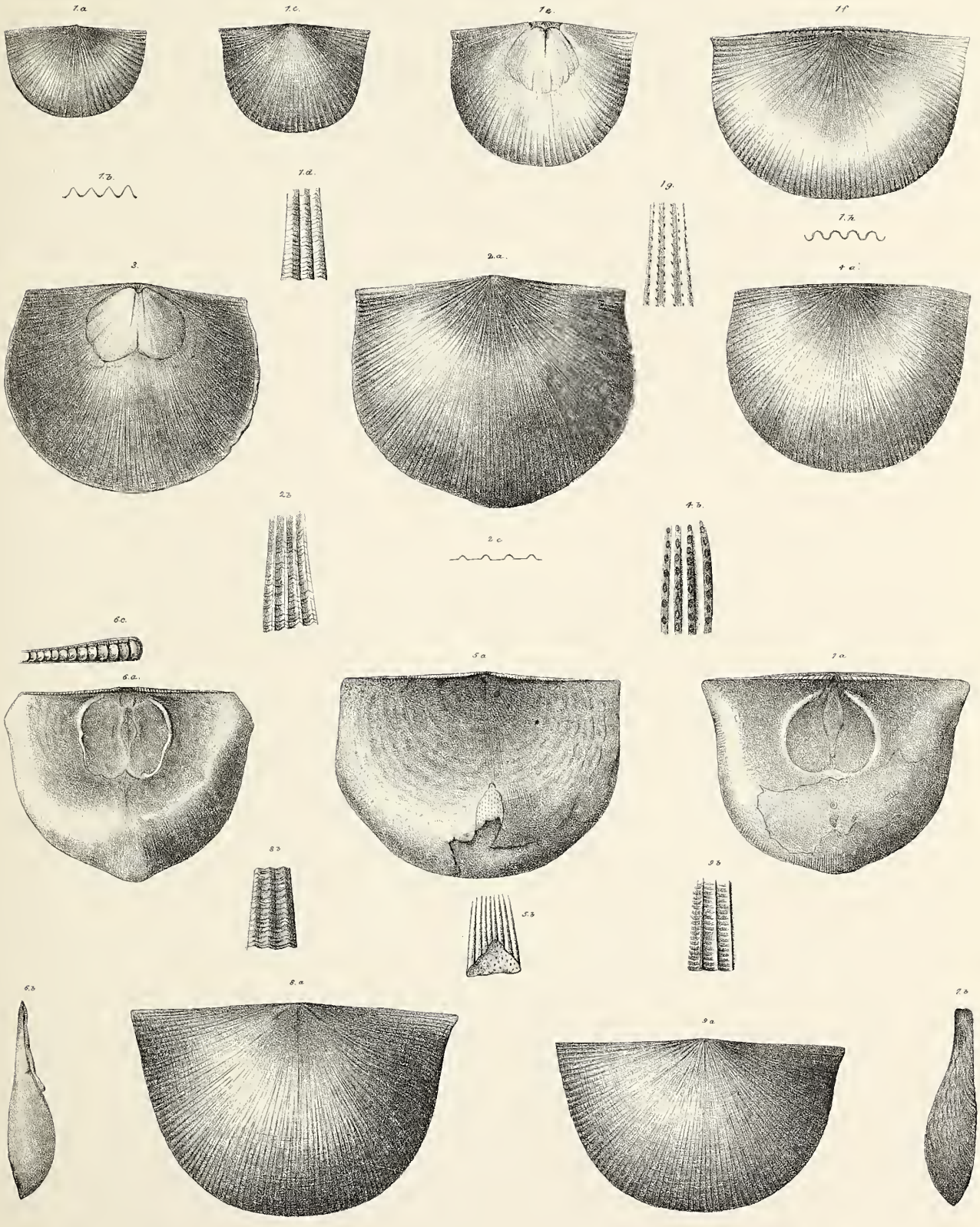
9 *b*. Enlargement of surface when the shell is partially exfoliated.

# LOWER HELDERBERG GROUP.

Delthyris Shaly Limestone

(BRACHIOPODA.)






On Stone by Swinton.

Lith of Rich[d] H. Pease, Albany.

# PLATE 22.

Page

Fig. 1 *a* – *t*. STROPHODONTA BECKII. 191

1 *a*. A young individual in which no corrugations are developed.

1 *b*, *c*. Two specimens exhibiting the extremes of form in the extension of the hinge-line, and showing the beginning of the development of the corrugations.

1 *d*. A specimen showing the corrugations more strongly.

1 *e*. An individual of full size, in which the corrugations are well developed.

1 *f*, *g*. Dorsal and ventral sides of an entire individual.

1 *h*. Profile view of the preceding specimen.

1 *i*. An old specimen where the corrugations are much stronger and closer than usual.

1 *k*, *l*, *m*. The interiors of several ventral valves, showing the area, crenulated hinge-line, muscular and vascular impressions, etc.

1 *n*. Area of the ventral valve.

1 *o*, *p*. Enlargement and profile of the striæ.

1 *r*. A portion of the area enlarged, showing the striated surface and crenulated margin.

1 *s*, *t*. Portions of the casts of the ventral valves of two different individuals, showing some slight difference in the character and strength of the impressions.

# LOWER HELDERBERG GROUP.

Delthyris Shaly Limestone

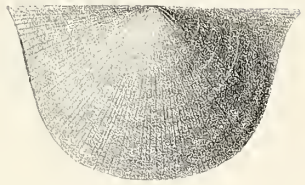
(BRACHIOPODA.)



1a

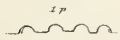
1b

1c.

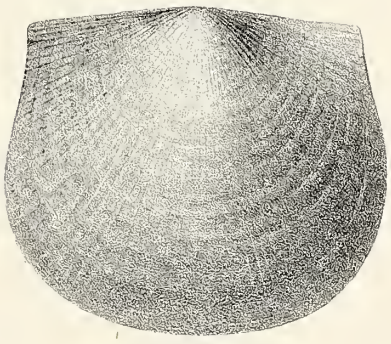


1d.

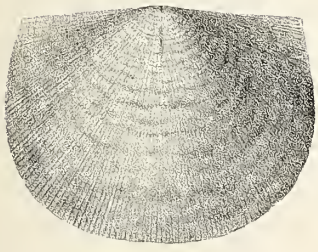
1p



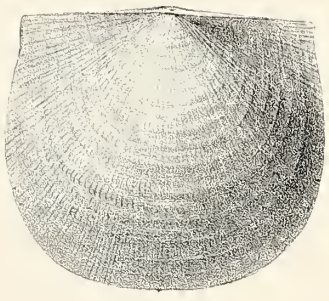
1e



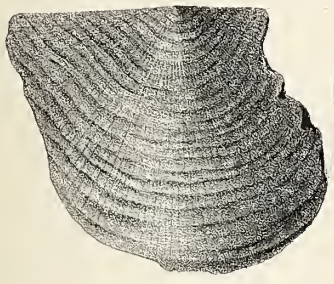
1a



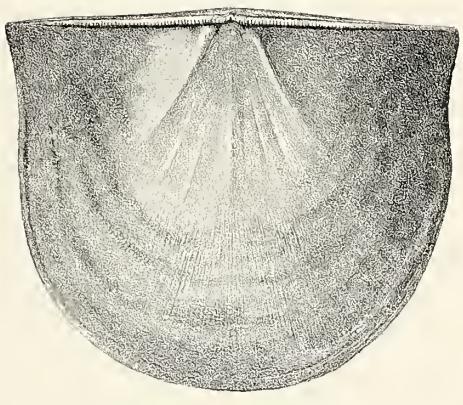
1f



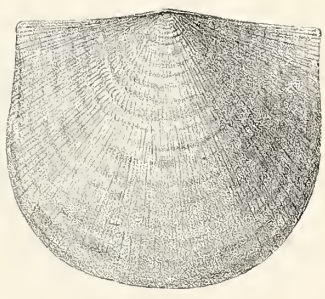
1i.



1k.



1g.

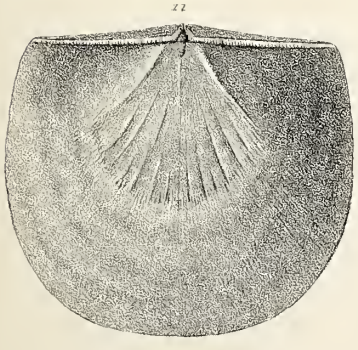


1r

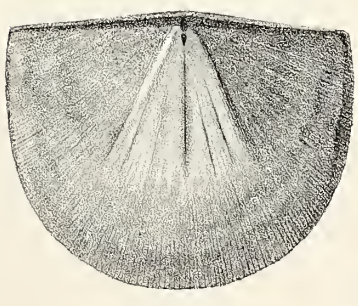
1n

1h

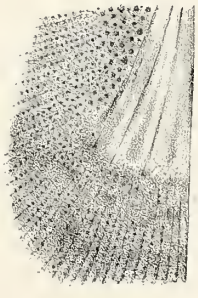
1l



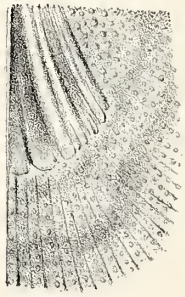
1m.



1j



1i.



On Stone by Swinton.

Lith. of Richd H Pease. Albany

# PLATE 23.

Page

Fig. 1 & 2. STROPHODONTA LEAVENWORTHANA. 189

1 *a*, *b*, *c*. Ventral, dorsal, and profile views of an entire specimen.

2 *a*, *b*. Dorsal and profile views of a full-grown individual.

2 *e*. Enlargement of the fine equal striæ.

Fig. 3. STROPHODONTA BECKII. 191

3. A cast of the interior of the dorsal valve.

Fig. 4, 5 & 7. STROPHODONTA PUNCTULIFERA. 188

4 *a*, *b*. The interior and profile view of the dorsal valve.

4 *c*. Profile view of a more gibbous specimen.

5 *c*. Cardinal view, showing the area enlarged.

7 *e*. Enlargement of striæ which are scarcely exfoliated, showing pustulose points, some of which are punctate at their extremities.

Fig. 6. STROPHODONTA GENICULATA. 483

6 *a*, *b*. Ventral and dorsal views of a small individual.

6 *c*. Profile of the same.

Fig. 7 *a* – *g*. ORTHIS STROPHOMENOIDES. 177 & 481

7 *a*. An imperfect dorsal valve of this species.

7 *b*. Enlargement of the surface striæ from 7 *a*.

7 *c*. A cast of the dorsal valve, showing the vascular and muscular impressions in a great degree of perfection.

7 *d*. A similar specimen, showing variations in the markings.

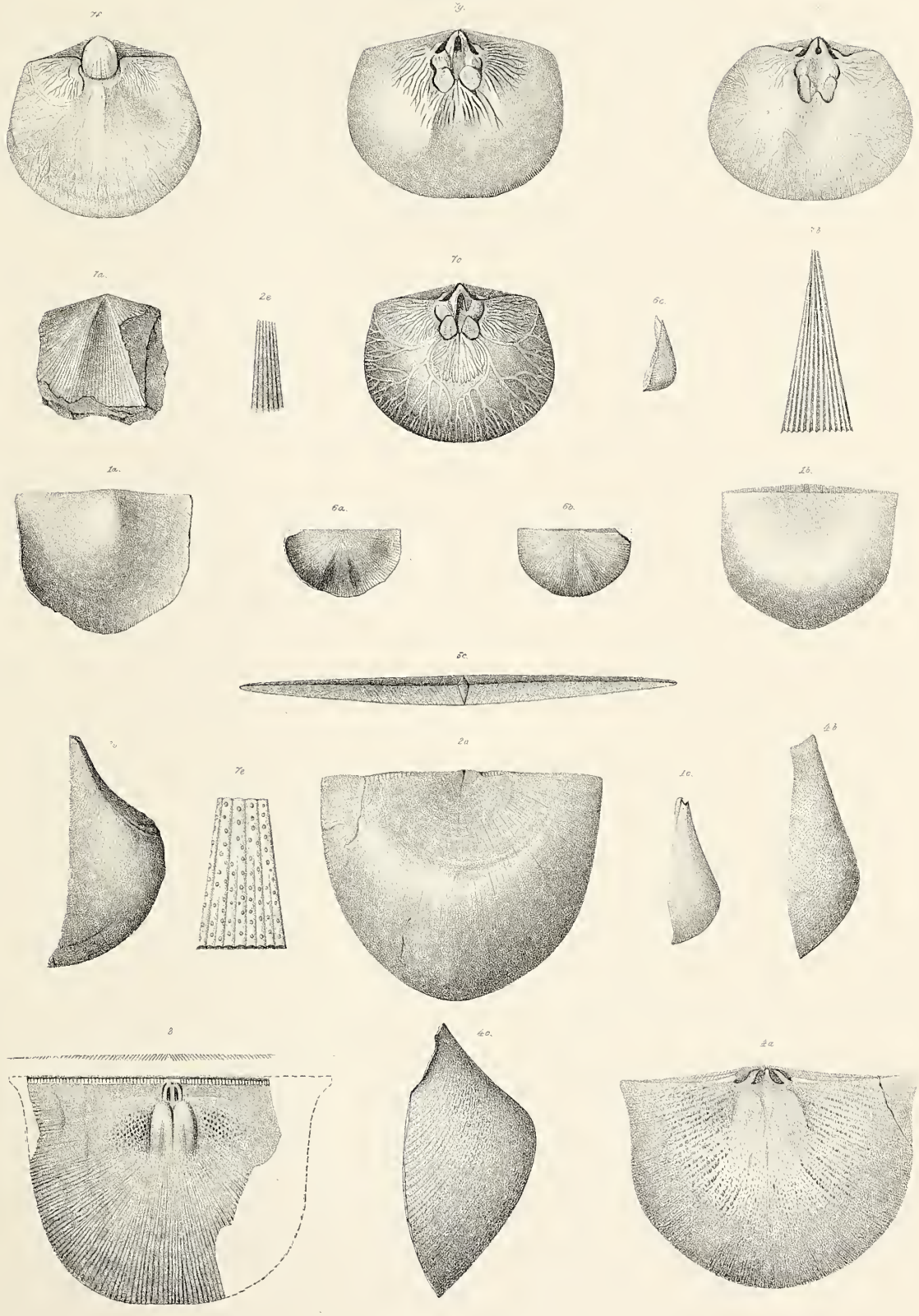
7 *g*. A similar cast, showing the muscular impressions, and the vascular impressions of the ovarian spaces.

7 *f*. A cast of the ventral valve, showing the muscular and vascular impressions.

Figures 2 *a*, *b* and *e*, and fig. 3, were drawn by Mr. F. B. MEEK; the remainder, by Mr. WHITFIELD.

The upper figure of 3 was intended as a correction (subsequently added) of the erroneous form of crenulations in the hinge of the one below.

(BRACHIOPODA.)




R.P. Whitfield, del.

Swinton, lith.

# PLATE 24.

Page

Fig. 1 *a* – *k*. ORTHIS VARICA. 179

1 *a* – *i*. Figures showing the gradation of size, form, etc.

1 *k*. Enlargement of the radiating striæ.

Fig. 2 *a* – *y*. CYRTIA DALMANI. 206

2 *a* – *y*. Illustrations of the ventral, dorsal, profile, and cardinal views of this species, representing the principal varieties of form and size.

Fig. 3 *a* – *t*. TREMATOSPIRA MULTISTRIATA. 209

3 *a* – *t*. Illustrations showing gradations of size, variety of form, etc.

3 *y*. Enlargement of the striæ.

# LOWER HELDERBERG GROUP.

Shady Limestone.



BRACHIOPODA.

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Lith of Richd H. Pease Albany

# PLATE 25.

Page

Fig. 1 *a* – *z*. SPIRIFER CYCLOPTERUS. 199

1 *a* – *s*. Figures of several individuals, showing gradations in size, modifications of form, etc.

1 *u*. Interiors of ventral valves.

1 *w*. Enlargement of surface where the edges of the lamellæ are ornamented with little granules, giving the appearance in profile as represented in 1 *x*.

1 *y*. The surface where the granules are worn off, and the lamellæ are seen to be finely striated.

1 *z*. Profile of the imbricating concentric striæ.

Fig. 2 *a* – *i*. SPIRIFER CONCINNUS. 200

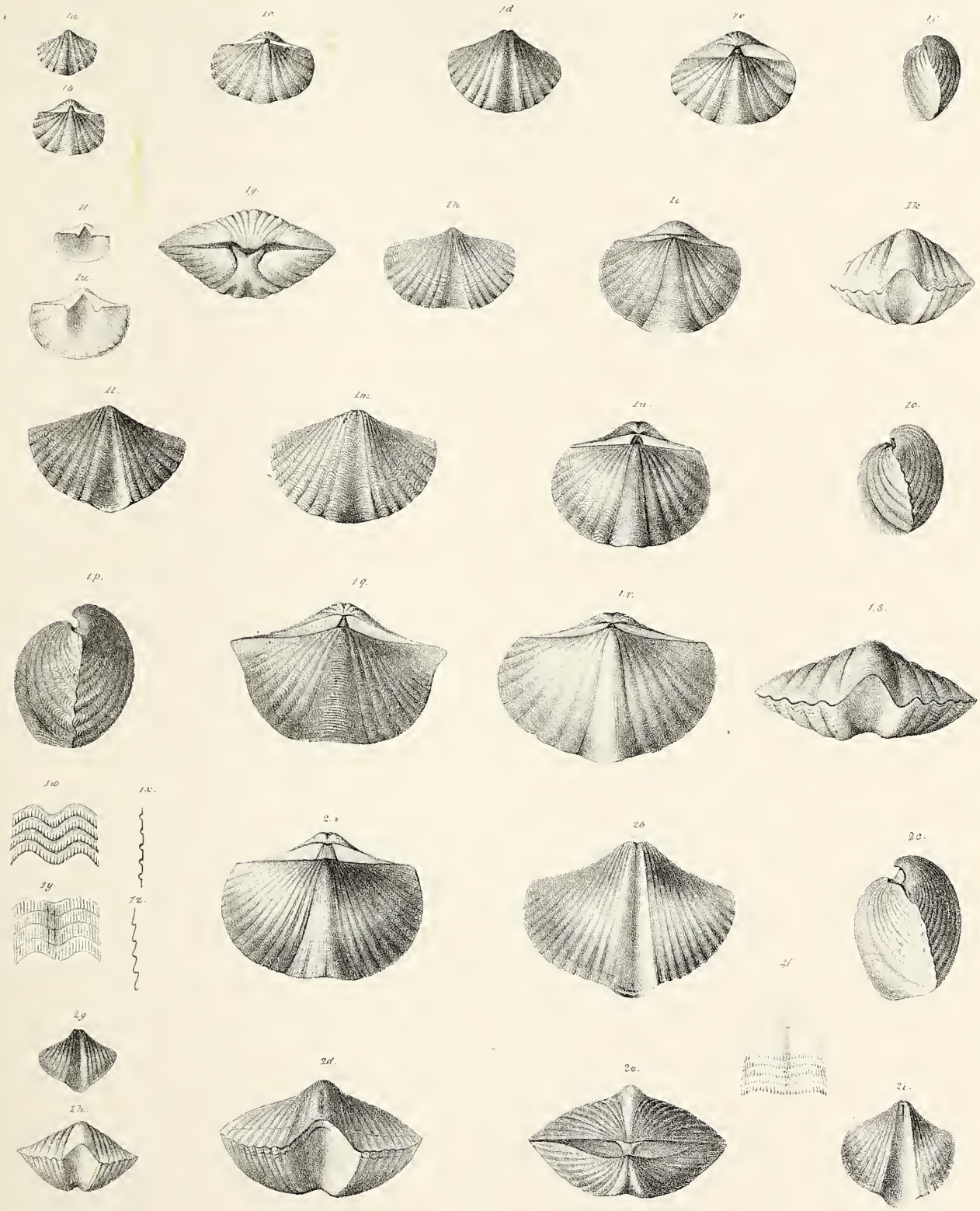
2 *a* – *e*. Views of a single large specimen from the shaly limestone.

2 *f*. Enlargement of the surface.

2 *g*, *h*, *i*. Ventral and front views of specimens from the Upper Pentamerus limestone.

Shaly Limestone.

BRACHIOPODA.



# PLATE 26.

Page

Fig. 1 & 2. SPIRIFER PERLAMELLOSUS. 201

1 *a* – *s*. Illustrations of gradations of size and differences of form presented by this species.

1 *t*. Enlargement of surface, showing the concentric lamellæ [which are not strong enough in the figure] and the fine longitudinal striæ.

2 *a*, *b*. Interiors of ventral valves.

2 *c*, *d*. Casts of the ventral and dorsal valves.

2 *e*. Enlargement of a portion of 2 *d*, showing the cavities left by the decomposition of the dental lamellæ.

2 *f*, *f*. Cast of the ventral valve, and enlargement showing the papillose surface.

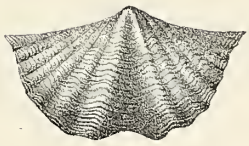
2 *g*. Cardinal view of a cast of this species.

BRACHIOPODA.

1a.

1b.

1c.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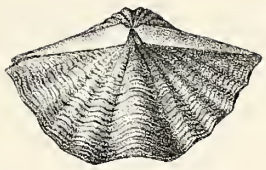
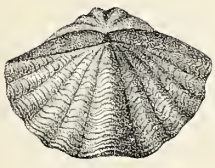
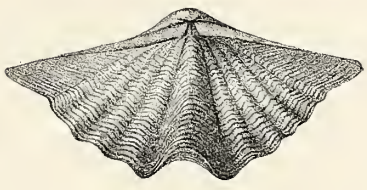

1e.

1f.


1g.

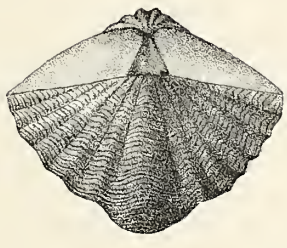
1h.


1i.

1k.

1l.

1o.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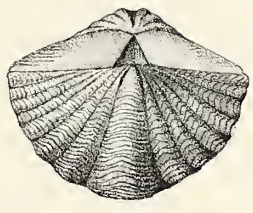
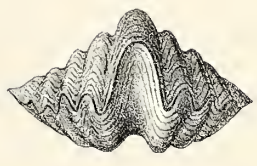
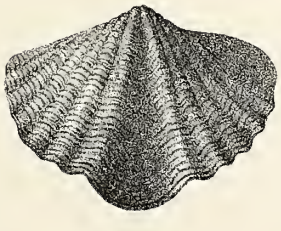

1p.


1r.

2c.

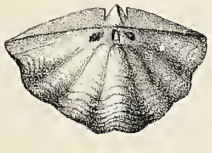

1n.

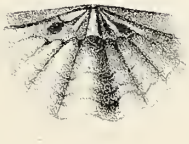
1s.

2a.

2b.

2f.


2d.


2e.

2f.

1t.

2g.

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Lith of Rich^d H. Pease Albany

# PLATE 27.

Page 202

Fig. 1 *a* – *p*. SPIRIFER MACROPLEURUS.

1 *a*. A young shell in which the plications are but faintly developed.

1 *b*, *c*. Dorsal and profile views of a specimen of medium size.

1 *d* & *h*. Front and cardinal views of the same.

1 *e*, *f*, *g*. Dorsal, front and cardinal views of a very symmetrical form of medium size.

1 *i*. Ventral valve of a specimen of larger size.

1 *k*. Ventral view of a larger individual, which is nearly of the maximum size observed.

1 *l*. A cast which is somewhat crushed from the base.

1 *m*, *n*. Interior of the ventral valve, and cast of the same.

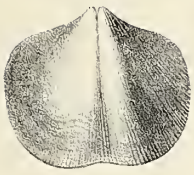
1 *o*. Part of the exterior of a slightly weathered specimen, showing the extremity of the spire.

1 *p*. Enlargement of the radiating striæ as seen under a lens upon the surface of ordinary specimens.

Shaly Limestone.

BRACHIOPODA.

1a.



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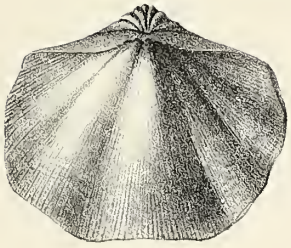
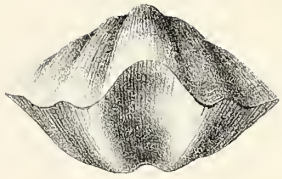
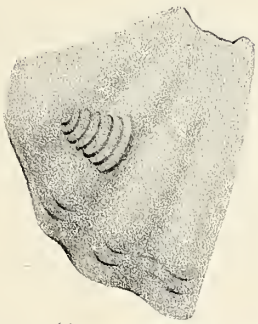


1c.

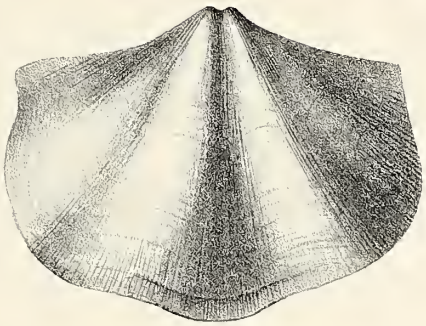
1d.



1o.

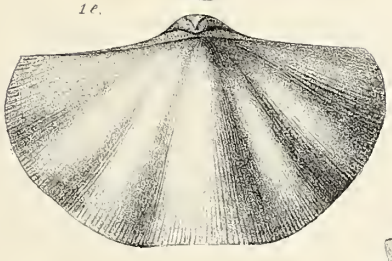


1i.

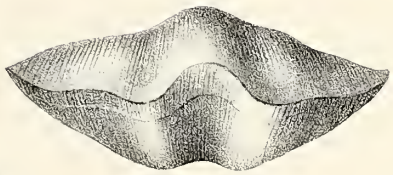


1p.

1e.



1f.



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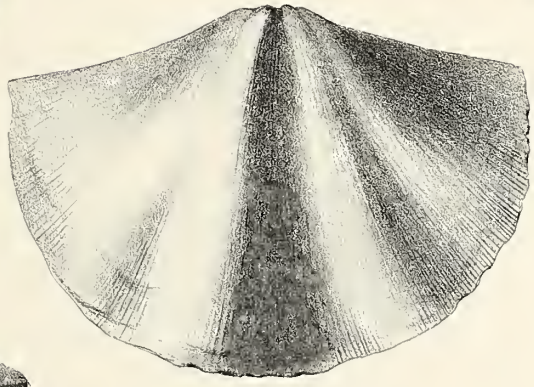

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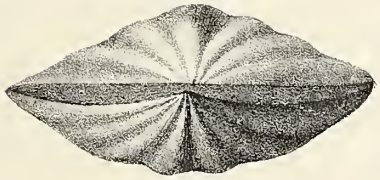

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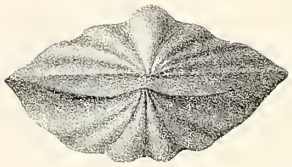
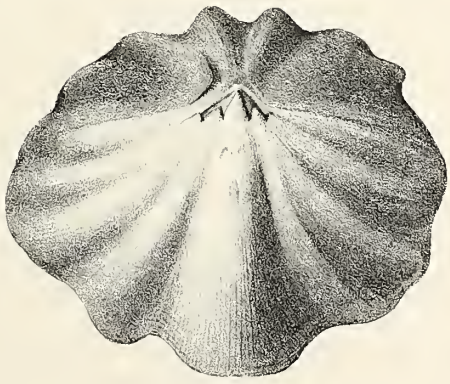


1l.



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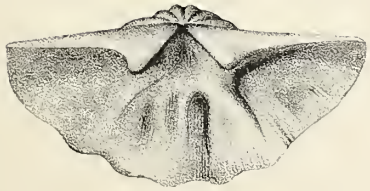
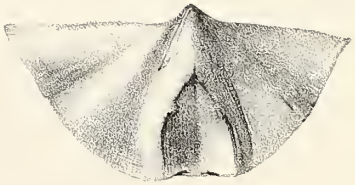


1n.



On Stone by. Swinton.

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# PLATE 28.

Page

Fig. 1 *a* – *f*. SPIRIFER MODESTUS. 203

1 *a*. Dorsal view of a specimen of ordinary size.

1 *b*, *c*, *d*. Ventral, dorsal and profile views of a larger individual.

1 *e*. The interior of the ventral valve.

1 *f*. Front view of 1 *a*.

Fig. 2 *a* – *f*. SPIRIFER SAFFORDI. 203

2 *a*, *b*, *c*. Dorsal, ventral, and profile views of the same specimen.

2 *e*. Front view of the same.

2 *f*. Enlargement of the surface.

Fig. 3 *a* – *d*. SPIRIFER TENUISTRIATUS. 204

3 *a*, *b*, *c*. Ventral, dorsal, and profile views.

3 *d*. Enlargement of the surface striæ.

Fig. 4 *a* – *e*. SPIRIFER OCTOCOSTATUS. 205

4 *a*, *b*, *c*. Ventral, dorsal, and profile views.

4 *a* †, *b* †, *c* †. Ventral, dorsal, and profile views of other specimens.

4 *d*. Cardinal view of 4 *c* †, showing the foramen.

4 *e*. Interior of the ventral valve.

Fig. 7. SPIRIFER CONCINNUS. 200

7 *a*, *b*. Dorsal and ventral views of a large specimen from the Upper Pentamerus limestone.

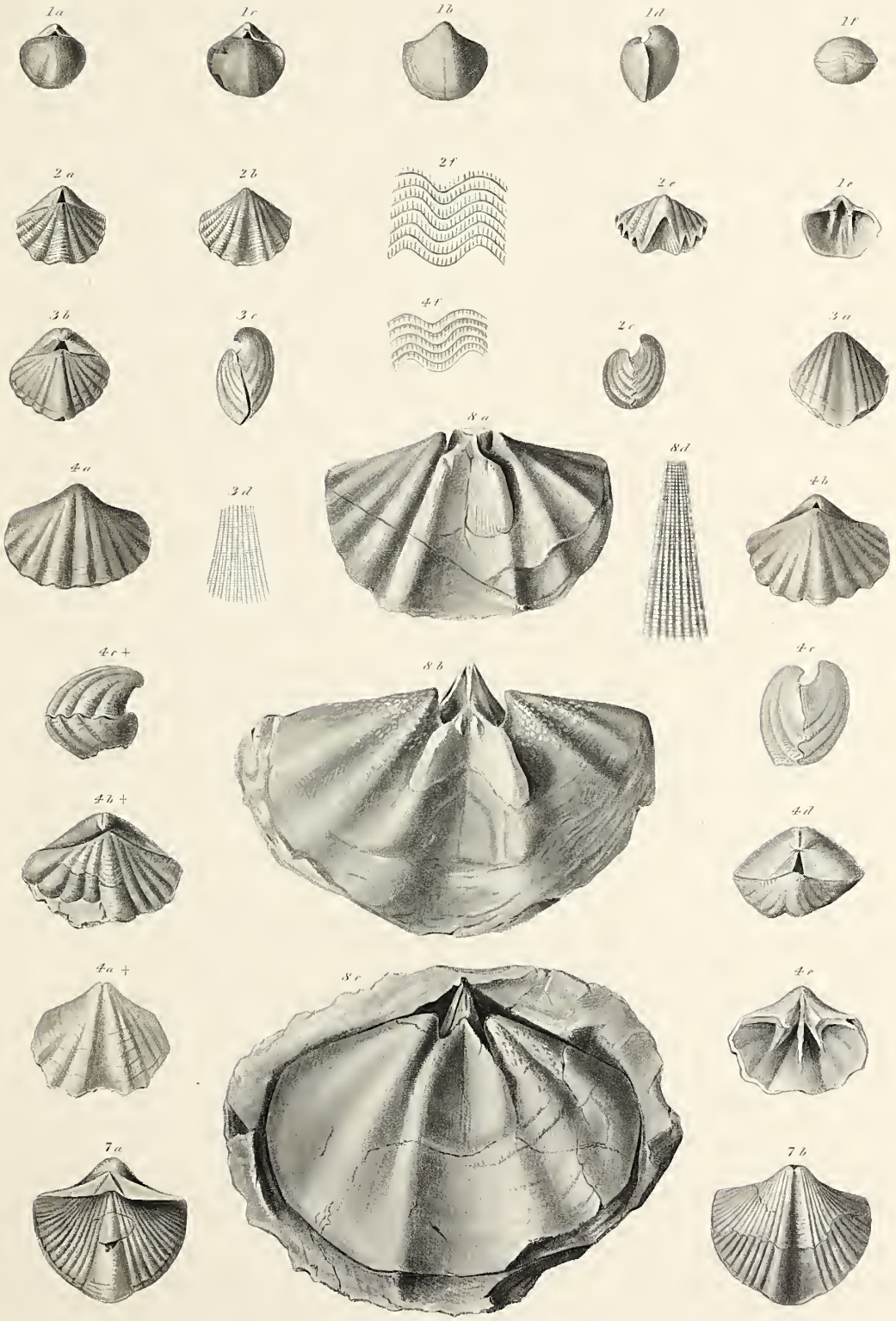
Fig. 8 *a* – *d*. SPIRIFER MACROPLEURUS. 202

8 *a*, *b*, *c*. Casts of the ventral valve, showing some variety in the forms of the muscular impressions.

8 *d*. Enlargement of the surface striæ, taken from an impression of the exterior in the shaly limestone where the shell has decomposed. The concentric striæ are rarely preserved on the surface of the shell.

# LOWER HELDERBERG GROUP.

(BRACHIOPODA)

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J. Hall, Jr. Albany, N.Y.

# PLATE 28 A.

Page

Fig. 1 *a* – *h*. TREMATOSPIRA CAMURA (of the Niagara group). 212

1 *a*. Dorsal view of a specimen of medium size.

1 *b*. Ventral view of the same, showing a single small plication in the mesial sinus.

1 *b* †. Ventral view of a specimen somewhat different in form.

1 *d*. Profile view of the same.

1 *e*. Enlargement of the beak, foramen and deltidium of the ventral valve, and the upper part of the dorsal valve.

1 *f*. Dorsal view of a shorter specimen, which has been cut transversely to show the internal spires.

1 *g*. Enlargement of plications, showing granulose surface and strong imbricating lines of growth.

1 *h*. Surface of plications enlarged, showing granulose surface without imbricating lines of growth.

Fig. 2 *a* – *f*. TREMATOSPIRA SIMPLEX. 211

2 *a*, *b*. Dorsal and ventral views of the specimen, natural size.

2 *c*, *d*. Front and profile view of the same.

2 *e*, *f*. Dorsal and ventral views of a larger specimen, the lateral extremities of which are broken off.

Fig. 3 *a* – *k*. TREMATOSPIRA PERFORATA. 208

3 *a*. Dorsal view of a small specimen.

3 *b*, *c*, *d*. Dorsal, ventral, and profile views.

3 *e*, *f*. Dorsal and ventral views of an older specimen with a deep sinus.

3 *g*, *h*. Front views of a young and an old specimen, showing the shallow and deeper mesial sinus.

3 *i*. Ventral side of an imperfect specimen, showing the internal spire.

3 *k*. Enlargement showing the perforated beak and the junction of the valves.

Fig. 4 *a* – *e*. TREMATOSPIRA COSTATA. 210

4 *a*, *b*. Dorsal and ventral valves.

4 *c*, *d*. Profile and front views.

4 *e*. Enlargement of the surface, showing the granulose punctate character, which is obscure from the silicification of the shell.

Fig. 5 *a* – *f*. TREMATOSPIRA MULTISTRIATA. 209

5 *a*. An individual of medium size, having the beaks closely incurved, and without indication of an area.

5 *b*. Dorsal view, where the minute perforation in the beak of the ventral valve is barely seen above the summit of the opposite one.

5 *c*, *d*, *e*. Ventral, front, and profile views of the same individual.

5 *f*. The interior of a ventral valve, showing the remains of internal spires.

BRACHIOPODA

# PLATE 28 B.

Fig. 1 *a* – *d*. NUCLEOSPIRA PISIFORMIS.

*Orthis pisum* : Pal. New-York, Vol, ii, p. 250. This species proves, on examination, to belong to the Genus NUCLEOSPIRA. It is a smaller species than that of the Lower Helderberg rocks, while it is larger and more gibbous than the *N. concentrica*.

1 *a*, *b*. Dorsal and ventral views of a specimen, natural size.

1 *c*. Profile view of the same.

1 *d*. An enlargement of the surface.

Page

Fig. 2 – 9. NUCLEOSPIRA VENTRICOSA. 220

2 *a*, *b*, *c*. Illustrations of a form having the beak more elevated than usual.

3 *c*, *d*. An individual preserving the remains of the fine hair-like spines which cover the surface of perfect specimens; and an enlargement of the same.

4 *a*, *b*. A cast of the interior.

5. The interior of a ventral valve preserving the internal spires, enlarged to three diameters.

6 *a*. The dorsal valve, showing the extended cardinal process and the longitudinal septum.

6 *b*. Profile of the same.

6 *c*, *d*. Enlargement of the preceding figures.

7 *a*, *b*. Interior of the ventral valve, and profile view of the same : enlarged figures.

8. Interior, showing the articulation of the valves : *t*, *t*, the cardinal teeth; *J*, the cardinal process; *B*, *B*, the brachial processes.

9. Diagram showing a longitudinal section of the valves, the articulating teeth, the cardinal process, spire, and longitudinal septa *s*, *s*.

9 *a*. An enlarged view of the interior of the dorsal valve, showing the crura, the bases of the arms for half a turn, and the connecting process which ascends from the dorsal side towards the centre of the spire as shown in fig. 9.

Fig. 10 – 15. NUCLEOSPIRA ELEGANS. 222

10 *a*, *b*. Dorsal and ventral views of a very symmetrical specimen of the ordinary size, showing slight indications of the central flattening or depression.

10 *d*. Profile view.

11 *a*. Dorsal view of a specimen which is proportionally broader.

12 *c*. Dorsal view of a specimen without mesial depression, and showing an extension in front.

13 *a*, *b*. Dorsal and front views of a large individual which is proportionally very broad and deeply depressed in front.

13 *c*, and 17 *b* (by error for 13 *d*). Dorsal and ventral views of a gibbous specimen, which is produced in front.

14. Ventral valve, showing the spire on one side displaced.

Fig. 16 – 19. NUCLEOSPIRA CONCENTRICA. 223

16 *a*, *b*, *c*. Dorsal, ventral and profile views of a small individual, from which the pilose covering has been removed.

16 *d*, *e*. Enlargement of the dorsal and ventral sides, showing more distinctly the subrhomboidal form and the concentric laminæ of growth. The perforation of the beak appears to have been somewhat enlarged by fracture, but this feature is conspicuous in all the specimens of this species.

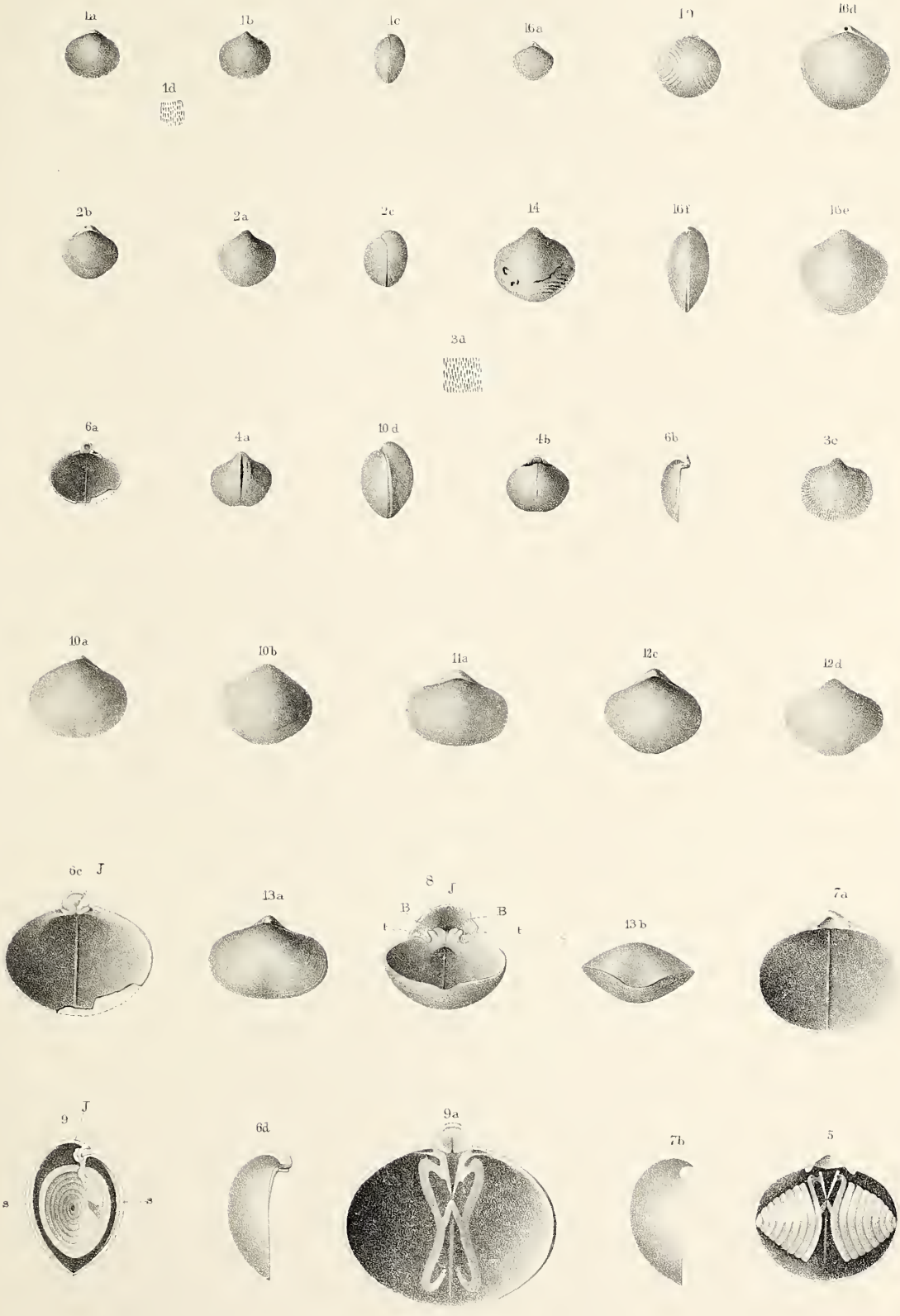
18. Dorsal view of a specimen, natural size.

19. A transverse section of a specimen, showing the internal spires.

# LOWER HELDERBERG GROUP.

(BRACHIOPODA.)





# PLATE 29.

Page

Fig. 1 *a* – *o*. RHYNCHONELLA SEMIPLICATA. 224

1 *a*, *b*, *c*. Young individuals which are nearly smooth, or with faint undulations towards the front.

1 *d*, *e*. A small individual having the front extremely plicated.

1 *f* – *n*. Illustrations of the prevailing forms, variety of plications, etc.

1 *o*. Enlargement of the surface, showing the concentric and longitudinal striæ.

Fig. 2 *a* – *i*, & 3. RHYNCHONELLA ÆQUIVALVIS.* 224

2 *a*, *b*, *c*. Young individuals of this species.

2 *d*, *e*, *f* & *h*. Dorsal, ventral, profile, and front views of a larger individual.

2 *i*. Enlargement of the concentric striæ.

3 *a*, *b*, *c*. An individual having a shorter and more rotund form, with a faintly marked sinus in front. This is probably a distinct species.

Fig. 4 *a* – *o*. RHYNCHONELLA MUTABILIS. 225

4 *a*, *b*, *c*. Young shells having a more elongate form than the prevailing types.

4 *d* – *k*, and *p*. The shorter form of this shell in the smaller individuals.

4 *l* – *o*. The ovoid forms of this species.

* This species is probably not a true RHYNCHONELLA : its surface-characters and form approach to RENSSELÆRIA, while in other respects it resembles RHYNCHOSPIRA.

# LOWER HELDERBERG GROUP.



## Pentamerus Limestone.

(BRACHIOPODA.)

On Stone by Swinton.

# PLATE 30.

Page

Fig. 1 *a* – *e*, & 2 *a* – *r*. RHYNCHONELLA MUTABILIS. 225

1 *a* – *e*. Ovoid forms of this species.

2 *a*, *b*, *c*. Profile views of the more gibbous forms, showing the gradual expansion of the dorsal valve.

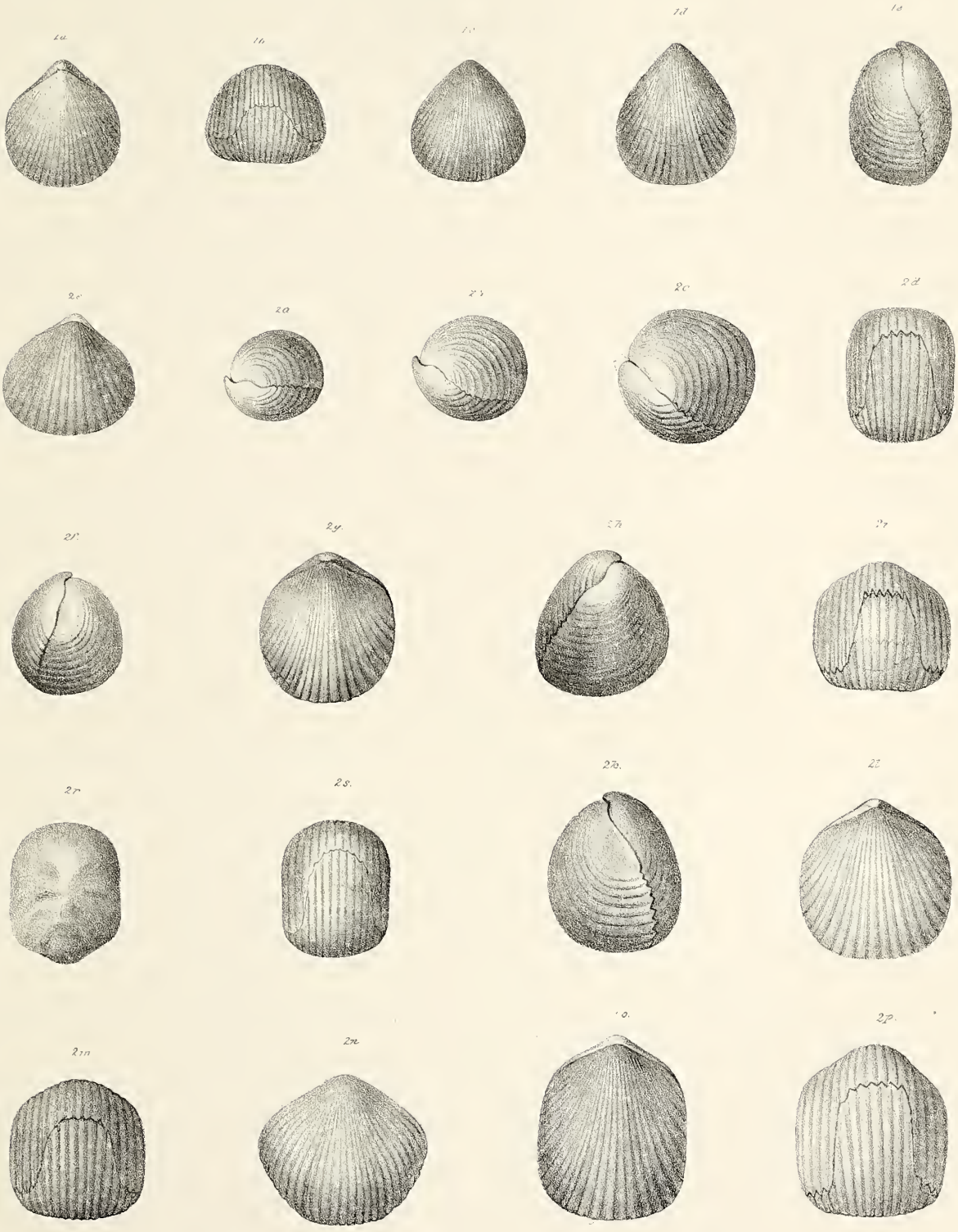
2 *d*, *e*. Front and dorsal views of a very gibbous form.

2 *f* – *p*, and *s*. Illustrations of extremely gibbous forms, which sometimes present a subquadrangular outline, and some variation in the form of the broad extension of the mesial sinus in front, and in the proportional length and breadth of the dorsal valve as shown in 2 *l* and 2 *o*. The form 2 *n* is rare, but is nevertheless one which the species sometimes assumes.

2 *r*. Cardinal view of a cast of this species.

Pentamerus Limestone.

(BRACHIOPODA.)



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# PLATE 31.

Page

Fig. 1 *a* – *f*, & 2 *a* – *y*. RHYNCHONELLA NUCLEOLATA. 227

1 *a*, *b*, *c*. A young individual and one of medium size, having smaller plications than usual, and a larger number upon the mesial sinus.

1 *d*, *e*, *f*. Larger individuals having stronger plications than the preceding, and a larger number upon the mesial fold and sinus than those which follow

2 *a* – *e*. Figures presenting the ordinary character of the smaller individuals of this species.

2 *f* – *t*. Illustrations of the gradations in size, form, and proportions of this species.

2 *u*, *x*, *y*. A cast of this species, showing the form of the muscular impression in the ventral valve, the median plate of the dorsal valve, and the alveolar cavities.

Fig. 3 *a* – *d*. RHYNCHONELLA ABRUPTA. 228

3 *a*, *b*. Dorsal and ventral views of a well-marked individual of this species.

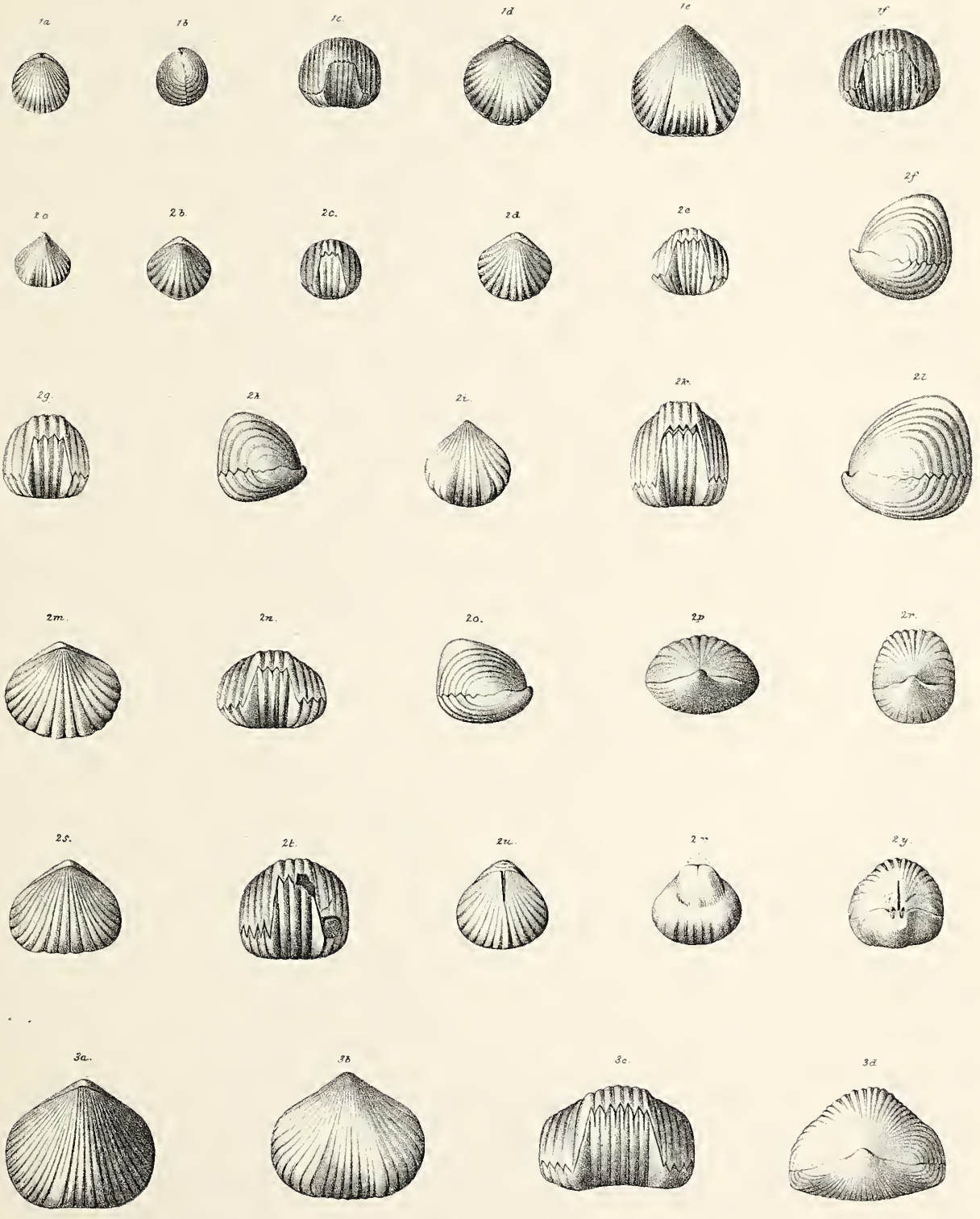
3 *c*, *d*. Front and cardinal views of another individual.

# LOWER HELDERBERG GROUP.

Shaly Limestone

(BRACHIOPODA)



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# PLATE 32.

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Fig. 1 *a* – *z*, & 2 *a* – *d*. RHYNCHONELLA PYRAMIDATA. 229

1 *a* – *d*. Young individuals of this species.

1 *e* – *z*. Illustrations of the varying forms of this species, from those of medium size to the largest and most gibbous forms that have been observed.

2 *a*. A cast of the ventral valve of this species, showing the muscular impression smaller than in *R. nucleolata*, Plate xxxi, fig. 2 *x*.

2 *b*. A cast of the dorsal valve of the same species.

2 *c*. Interior of the ventral valve, which partially preserves the form of the muscular imprint.

# LOWER HELDERBERG GROUP.

Shaly Limestone.

BRACHIOPODA.

1a.

1b.

1c.

1d

1e

1g.

1h.

1i.

1k

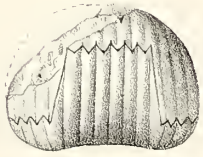
1f.

1l.

1m

1n.

1o


1p.

1r

1s.

1t.

1u.

2a.

1x.

1y.

1z.

2c.

2h

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# PLATE 33.

Page

Fig. 1 *a* – *p*. RHYNCHONELLA VELLICATA. 230

1 *a* – *e*. Dorsal, ventral, and profile views of characteristic specimens.

1 *f*, *g*. A form more rotund than usual.

1 *h*. An individual with a strongly marked sinus and much elevated mesial lobe.

1 *i*. Profile view of a gibbous form.

1 *k*, *l*, *m*, *n*. More gibbous forms, which may probably be a variety of *R. abrupta*.

1 *o*. Enlargement of the plications in front, showing the central impressed lines and arching striæ.

1 *p*. Cast of the ventral valve, showing the lobed muscular impression.

Fig. 2 *a* – *k*. RHYNCHONELLA ALTIPLICATA. 231

2 *a*, *b*. Dorsal views of two small individuals.

2 *c*, *d*. Front views of the same.

2 *e*. Profile of one of these.

2 *f*, *g*. Dorsal and ventral views of a larger individual.

2 *h*, *i*. Front and profile of the same.

2 *k*. Enlargement of the surface, showing the angular plications and sharply arching striæ, which are more closely arranged than represented in the figure.

Fig. 3 *a* – *e*. RHYNCHONELLA ACUTIPLICATA. 232

3 *a*, *b*. Dorsal and ventral views of a specimen of this species.

3 *c*, *d*. Profile and front views of the same.

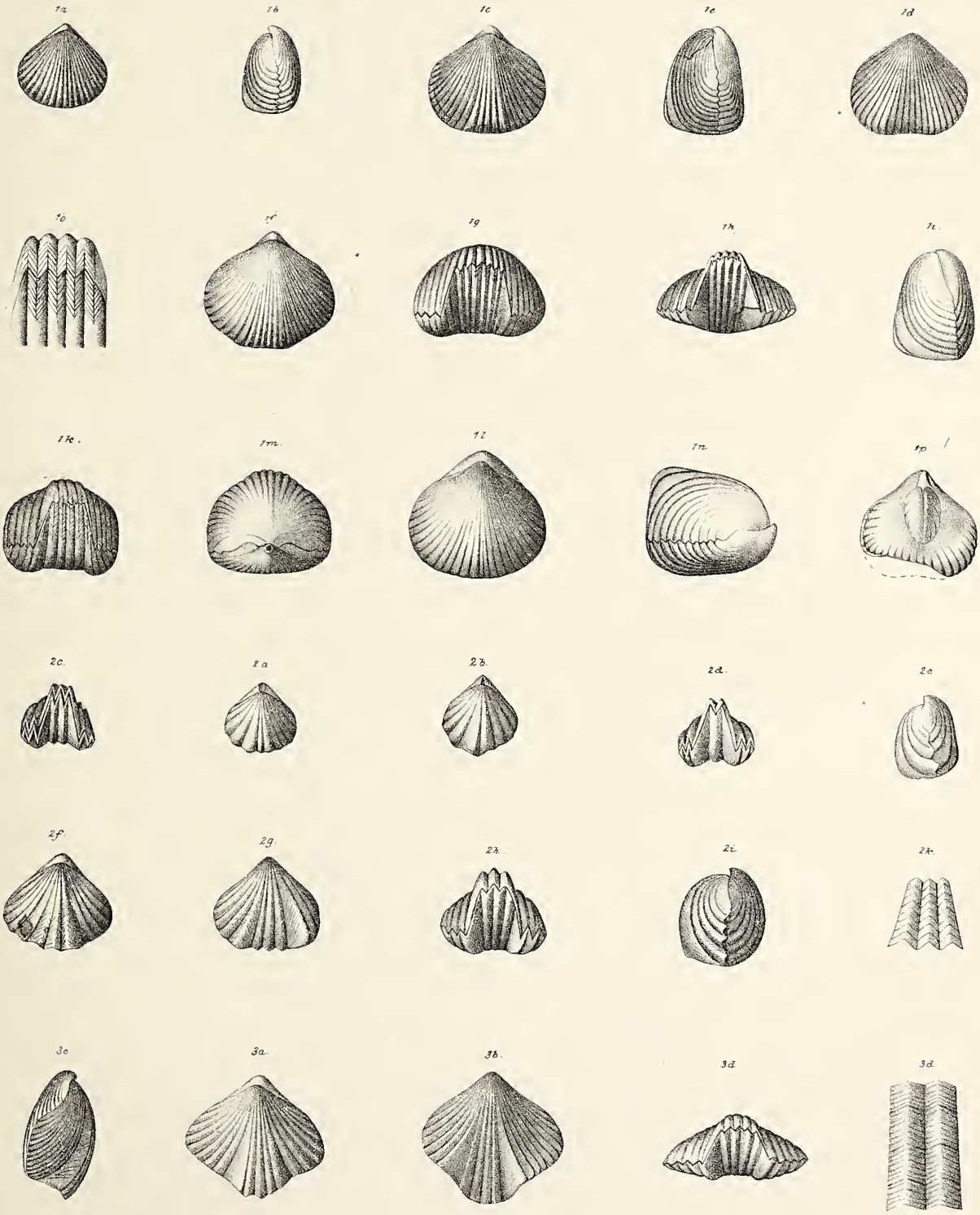
3 *e* ( by mistake 3 *d* ). Enlargement of the plications and concentric striæ

# LOWER HELDERBERG GROUP.

Shaly Limestone

(BRACHIOPODA)



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# PLATE 34.

Page

Fig. 1 – 6. RHYNCHONELLA? BIALVEATA. 233

1 *a*, *b*. Dorsal and ventral views of a small individual.

2 *a*, *b*, *c*. Dorsal, ventral, and profile views of a less elongate form.

3 *a*, *b*, *c*. An individual having the plications nearly equal, and showing scarcely any indication of a sinus in front.

4. An enlarged figure of the same species.

5 *a*, *b*, *c*, & 6 *a*, *b*, *c*. RHYNCHONELLA SEMIPLICATA?

The forms here figured closely resemble the *R. semiplicata* of the Pentamerus limestone; being a little more rotund, and deeply sinuate. This form is extremely rare in the shaly limestone of the Lower Helderberg group.

Fig. 7 & 8. RHYNCHONELLA INUTILIS. 233

7 *a*, *b*. Ventral and profile views of a small individual.

8 *a*, *b*. Ventral and front views of a more rotund form.

Fig. 9 – 19. RHYNCHONELLA TRANSVERSA. 234

9 – 14 *a*, *b*, *c*. A series of individuals showing a regular gradation in size, with a gradually increasing depth of sinus.

15 & 16 *a*, *b*, *c*. Individuals having a more strongly defined sinus and mesial lobe; a single individual having but two folds in the sinus.

17 – 19 *a*, *b*. RHYNCHONELLA TRANSVERSA? *var*.

These forms present some differences of character from those referred to the species proper; being somewhat more circular, and the lateral plications a little curving.

Fig. 20 & 21. RHYNCHONELLA RUDIS. 235

20 *a*, *b*, *c*. Ventral, front and profile views.

21 *a*, *b*. Profile and front view of a similar form, which varies in some respects.

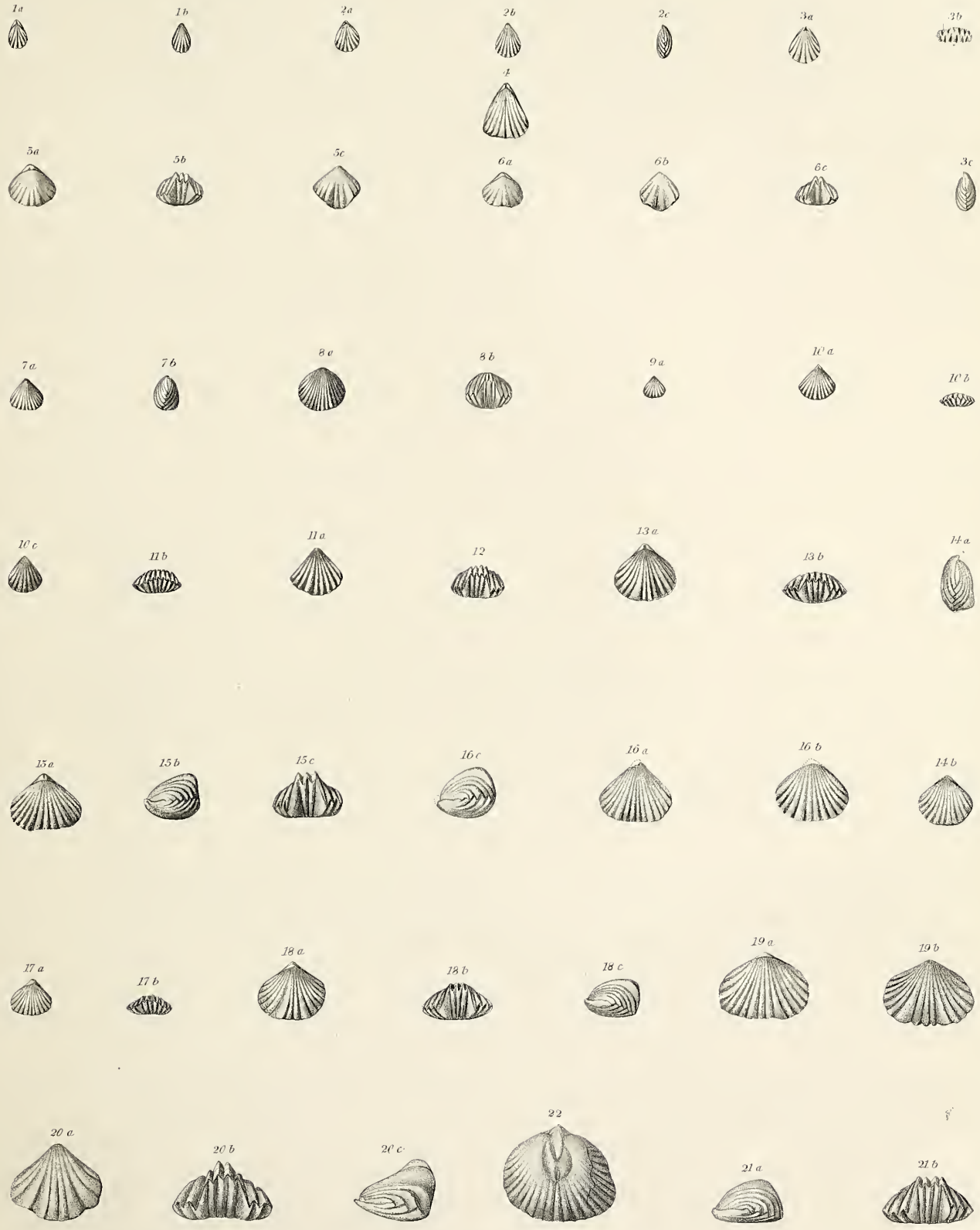
Fig. 22. RHYNCHONELLA PLANOCONVEXA. 235

22. A cast of the dorsal valve, preserving the shell upon the margin.

# LOWER HELDERBERG GROUP

## (SHALY LIMESTONE)

(BRACHIOPODA)




F.B. Meek Del

# PLATE 35.

Page

Fig. 1 & 2. RHYNCHONELLA SULCOPLICATA. 236

1 *a*, *b*. Ventral and front views.

1 *c*. Enlargement of the striæ.

2 *a*, *b*, *c*, *d*. Undetermined forms of RHYNCHONELLA.

Fig. 3 – 5, & 6 *a* – *y*. RHYNCHONELLA FORMOSA. 236

3, 4 *a b c d e f*, & 5, may be young forms of *R. formosa*, possessing some characters not observed in authentic specimens of that species, but approaching figures 6 *f*, *g*, *h*.

6 *a* – *e*. Ventral, dorsal, profile, and front views of several individuals of the typical form, with strong plications.

6 *f* – *l*. Specimens with finer and more numerous plications.

6 *m* – *y*. Illustrations of specimens which present the ordinary variations of full-grown individuals, from the Upper Pentamerus limestone.

# LOWER HELDERBERG GROUP.

D. Shaly and upper Pentamerus Limestone

(BRACHIOPODA.)

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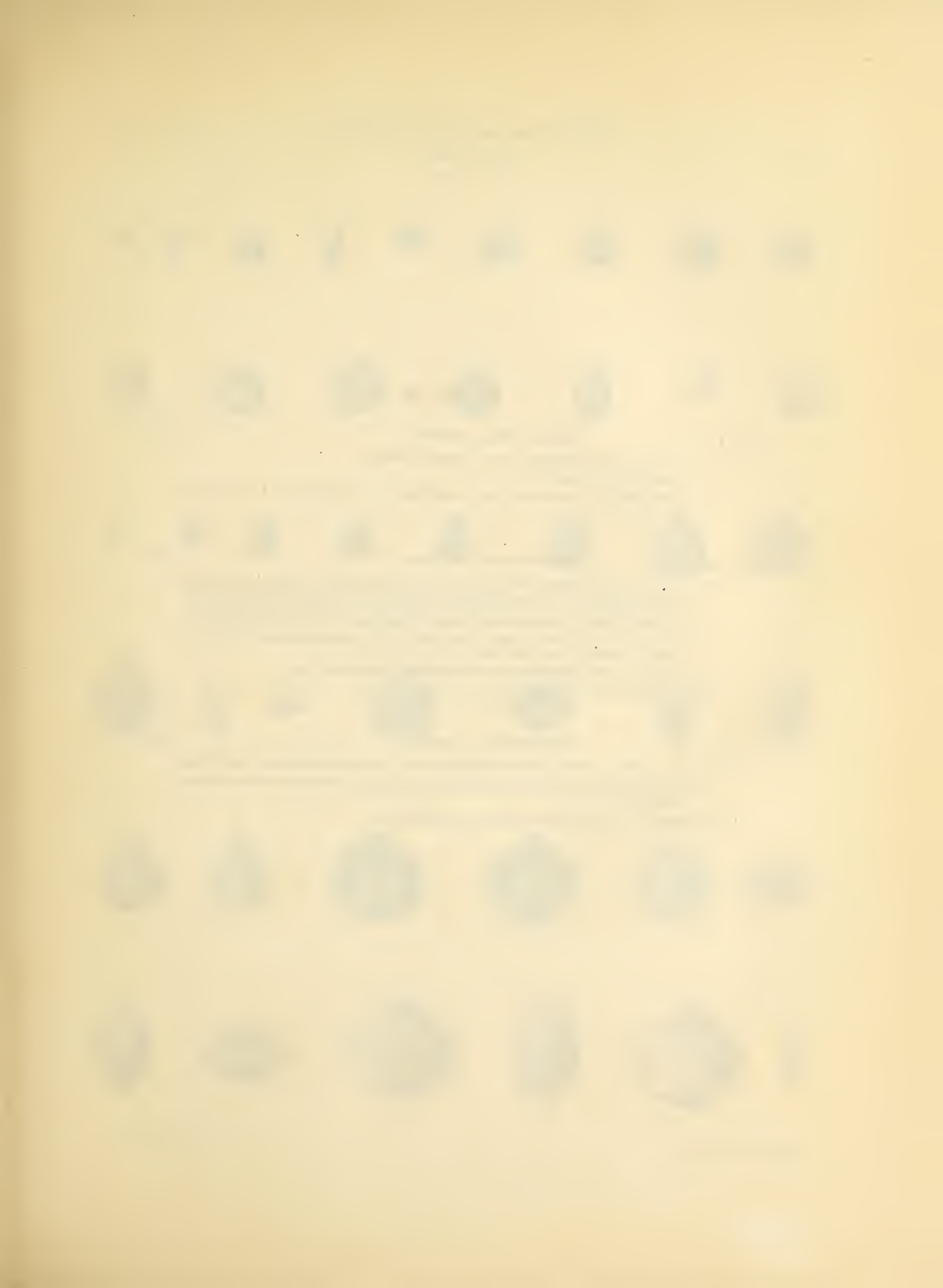
# PLATE 36.

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Fig. 1 *a* – *p*. TREMATOSPIRA GLOBOSA. 215

1 *a* – *e*. Dorsal, profile, and front views of young individuals.

1 *f* – *k*. Individuals of larger size.

1 *l* – *p*. Individuals of full size, showing some differences in the plications and in the elevation of the beak.

Fig. 2 *a* – *t*. TREMATOSPIRA FORMOSA. 215

2 *a* – *e*. Young shells of this species, the plications fine and equal. The foramen is represented as extended below the beak, and having a triangular form from the absence of the deltidium : this, however, is an accidental condition, as the young shells frequently preserve the deltidium entire, and present the round perforation as in the beak of old shells.

2 *f*. An individual having strong angular striæ more like the preceding species, but with the elongate form and narrow beak characteristic of this one.

2 *g* – *k*. Dorsal, profile, and front views of specimens of the ordinary size.

2 *l* – *t*. Individuals of larger size and very symmetrical form.

Fig. 3 *a* – *g*. TREMATOSPIRA DEWEYI. 216

3 *a*, *b*, *c*, *d*. Dorsal, ventral, profile, and front views of a very perfect specimen of medium size.

3 *e*, *f*, *g*. Ventral, dorsal, and profile views of a larger specimen, the sides of which slope more rapidly from the beak.

For explanations of *Trematospira rectirostra*, see Plate XCV A.

# LOWER HELDERBERG GROUP.

Shaly Limestone

(BRACHIOPODA)

On Stone by Swinton.

Lith of Rich[d] H Pease, Albany

# PLATE 37.

Page

Fig. 1 *a* – *y*. EATONIA MEDIALIS. 241

1 *a*, *b*. Individuals in which the plications are more numerous than in ordinary specimens.

1 *c*, *d*, *f*, *g*. Individuals in which the plications are much subdued, and in 1 *c d* are scarcely marked.

1 *e*. An individual more extended on the beak than usual.

1 *h* – *o*. Individuals presenting the usual varieties of form and surface of this species. Fig. 1 *o* preserves the fine longitudinal striæ.

1 *p*, *r*, *s*. Ventral, front, and cardinal views of an unusually large individual, the valves of which are slightly opened.

1 *t*, *u*. Ventral and dorsal views of the cast of a small individual.

1 *x*, *y*. Casts of the ventral valve.

Fig. 2 *a*, *b*, *c*. EATONIA EMINENS. 242

2 *a*. Dorsal valve of the cast.

2 *b*. Ventral view of the same.

2 *c*. Profile view, showing the great elevation of the dorsal valve.

Fig. 3 & 4. RHYNCHONELLA EMINENS. 237

3 *a*, *b*, *c*. Dorsal, front and profile views of an individual of medium size.

4 *a*. Dorsal valve of a larger individual.

# LOWER HELDERBERG GROUP.

Shaly Limestone.

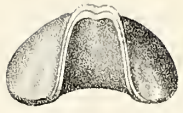
BRACHIOPODA.

1a

1b.

1c

1d.



1e.

1f

1g

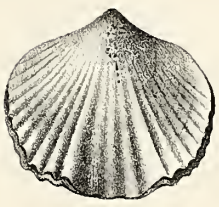
1h

1i.

1k

1l.

1m

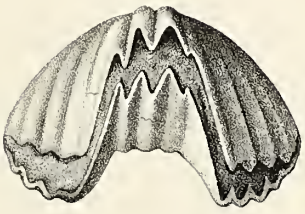


1n

1o

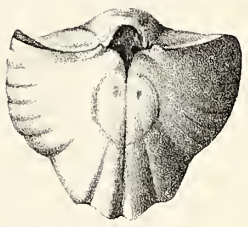
1p.

1r



1s

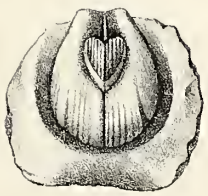
2a



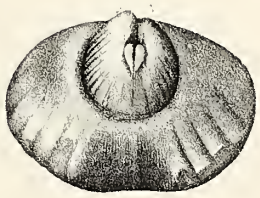
1t.

1u

1x.



1y



2b.

3a.

3b.

3c

4a

2c

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# PLATE 38.

Page

Fig. 1 – 7. LEPTOCŒLIA CONCAVA. 245

1 *a*, *b*, *c*, *d*, and 2 *a*, *b*, *c*. Dorsal, ventral, profile, and front views of this species.

2 *d*. Enlargement of the beak of the dorsal valve, showing the foramen and false area.

3 & 4. Specimens with a more extended hinge-line, and which present some slight differences in the striæ.

5 & 6. Interior of a small and of a large ventral valve.

7. The ventral valve enlarged.

Fig. 8 – 13. LEPTOCŒLIA IMBRICATA. 246

8, 9 & 10. Illustrations of the dorsal and ventral valves of the ordinary forms of this species.

11 & 12. Individuals differing somewhat in the plications from the more common forms.

13. Dorsal view of a specimen much enlarged.

Fig. 14 – 20. EATONIA SINGULARIS. 243

14 – 16. Ventral, dorsal, and profile views of specimens of the ordinary size.

17 *a*, *b*, *c*, *d*. Ventral, front, cardinal, and profile views of larger individuals.

18. Ventral valve of an unusually large species.

19 *a*, *b*. Ventral and dorsal views of a cast of this species.

20. Enlargement of the surface striæ.

Fig. 21 – 26. EATONIA PECULIARIS. 244

21. Illustration of one of the shorter forms of this species.

22 *a*, *b*. Dorsal and profile views of a specimen of the ordinary form.

23 *a*, *b*. Dorsal and front views of a full-grown specimen, showing the denticulations in front.

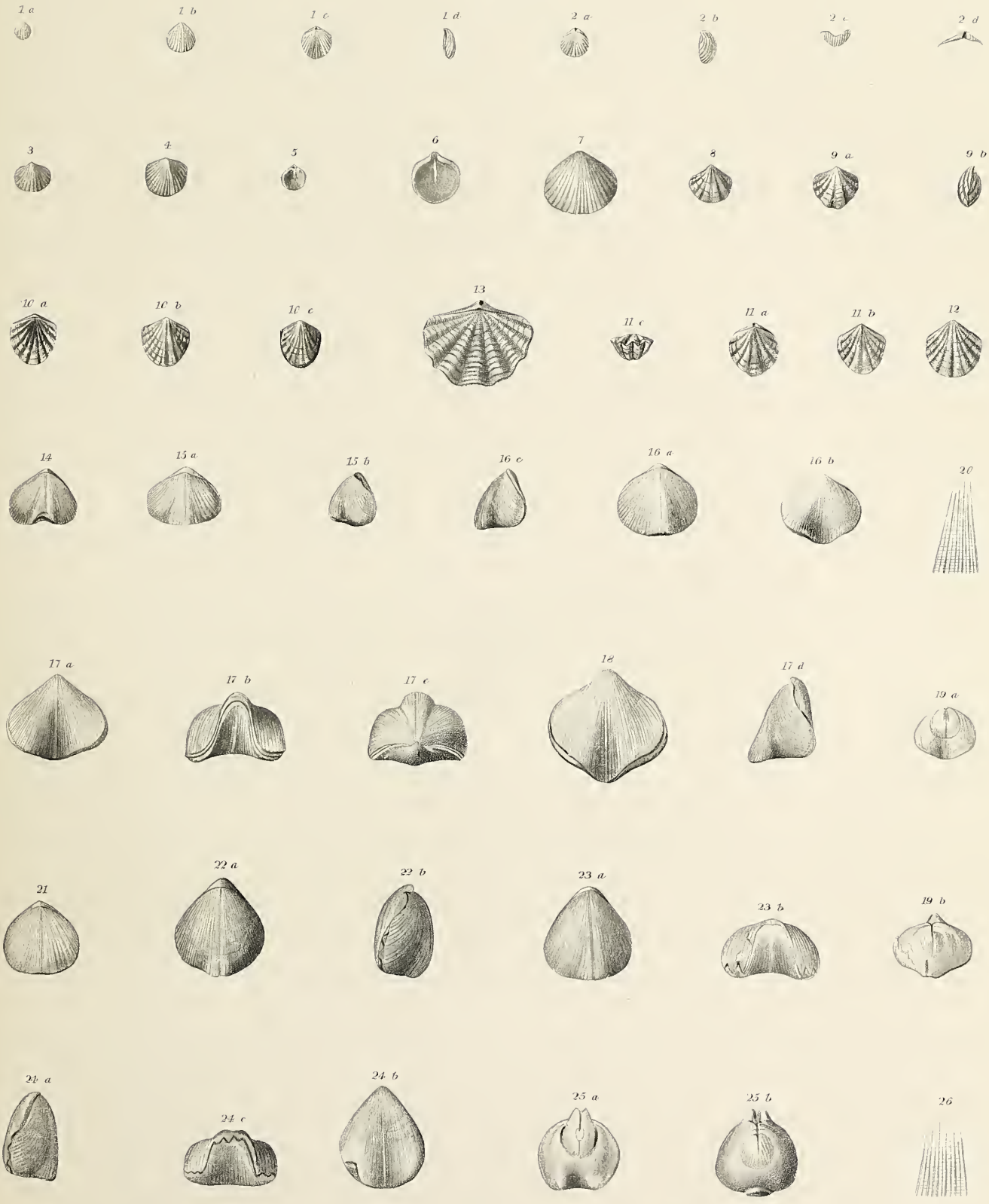
24 *a*, *b*, *c*. Profile, ventral, and front views of a specimen which shows more distinctly the dentieulations in front.

25 *a*, *b*. Ventral and dorsal views of a cast of this species.

26. Enlargement of the surface striæ.

SHALY LIMESTONE

( BRACHIOPODA )



# PLATE 39.

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Fig. 1 – 4. MERISTA ( = MERISTELLA) LÆVIS.

1 *a* – *d*. Dorsal, ventral, front, and profile views of a young, very gibbous specimen of this species, which shows a small but very deep sinus on the ventral valve.

2 *a* – *e*. Dorsal, profile, and front views of young specimens which are not very gibbous.

3 *a* – *e*. Views of young individuals, only one of which shows any evidence of a mesial sinus.

3 *f*, *g*, *h*, *i*, *k*. Dorsal, ventral, profile, and front views of larger specimens. The specimen fig. 3 *g* presents no emargination in front, as do the others 3 *f* – *k*.

3 *l*, *m*, *n*. Front, dorsal, and cardinal views of a full-grown specimen.

3 *o*, *p*, *r*, *s*. Dorsal, profile, ventral, and front views of a larger specimen, showing a stronger emargination in front, and a mesial sinus extending nearly to the beak of the ventral valve.

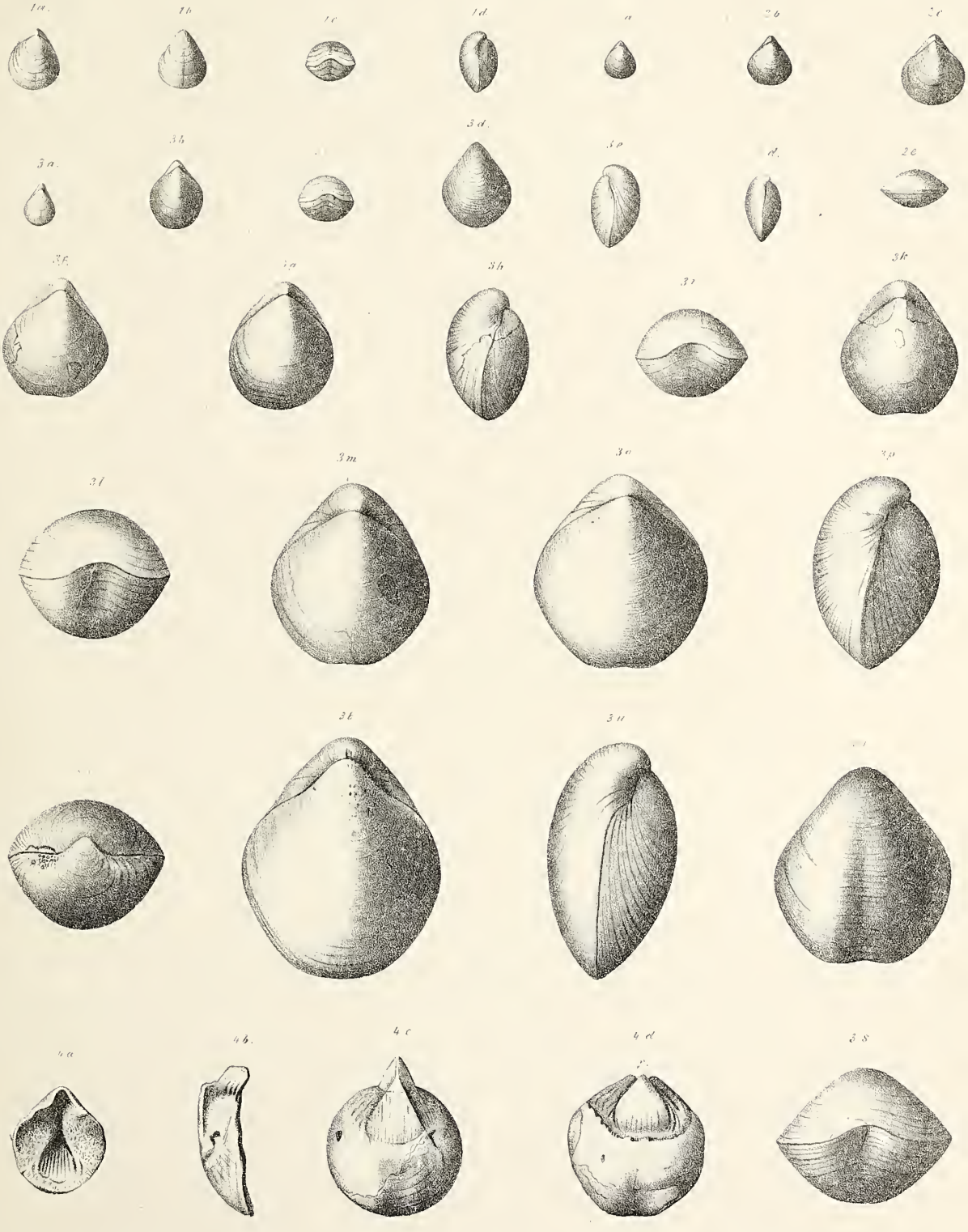
3 *t*, *u*. Dorsal and profile views of a larger individual, which has no sinus or elevation upon the valves. It is possible that this may prove a distinct species.

4 *a*. Interior of the ventral valve.

4 *b*, *c*, *d*. Casts of the ventral valve, and profile of the same.

Pentamerus and D. Shaly Limestone.

BRACHIOPODA.



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# PLATE 40.

Page

Fig. 1 *a* – *p*. MERISTA ( = MERISTELLA) BELLA. 248

1 *a* – *h*. Dorsal, ventral, profile, front, and cardinal views of young shells.

1 *i*, *k*, *l*. Views of a larger specimen. The species rarely attains a larger size than these figures.

1 *m* – *p*. Views of an unusually large specimen of this species.

Fig. 2 *a*, *b*. RENSSELÆRIA LÆVIS. 256

2 *a*, *b*. Dorsal and profile views of a specimen of this species.

Fig. 2 *c* – *f*, & 3 *a* – *d*. MERISTA ( = MERISTELLA) SUBQUADRATA. 249

2 *c*, *d*, *e*, *f*. Dorsal, ventral, profile, and front views of a young individual.

3 *a*. Dorsal view of this species.

3 *b*. Ventral view, showing the marks of the internal spires.

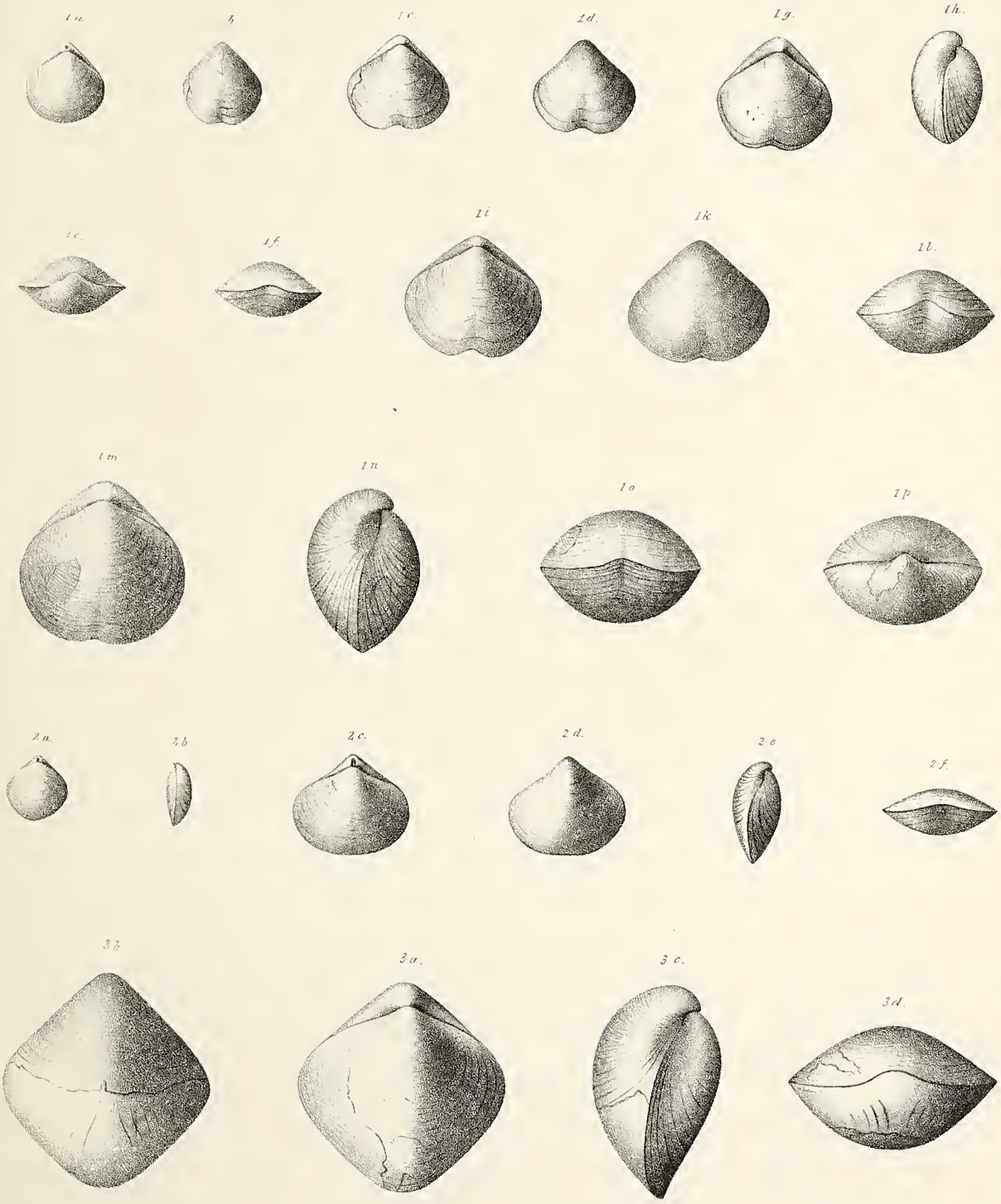
3 *c*, *d*. Profile and front view of the same.

# LOWER HELDERBERG GROUP.

Shaly Limestone.



BRACHIOPODA.

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# PLATE 41.

Page

Fig. 1 *a* – *t*. MERISTA ( = MERISTELLA) ARCUATA. 249

1 *a*, *b*. Dorsal and cardinal views of a young specimen.

1 *c*, *d*, *e*, *f*. Dorsal, ventral, and profile views of large specimens.

1 *g*, *h*, *i*, *k*, *l*. Dorsal, ventral, profile, and front views of full-grown individuals, showing the forms of well-preserved specimens.

1 *m*, *n*. Dorsal and profile views of a very gibbous form, which is unusually extended laterally.

1 *o*. Interior of a ventral valve.

1 *p*. Cast of the beak of the ventral valve.

1 *t*. An imperfect specimen which has been eroded at the sides, showing the internal spires.

Fig. 2 *a* – *g*. Casts of MERISTA ( = MERISTELLA) : Probably of *M. arcuata*. 250

2 *a*. Cast of the dorsal valve.

2 *b*. Cast of the ventral valve, showing the muscular impressions and extended process which filled the beak of the shell.

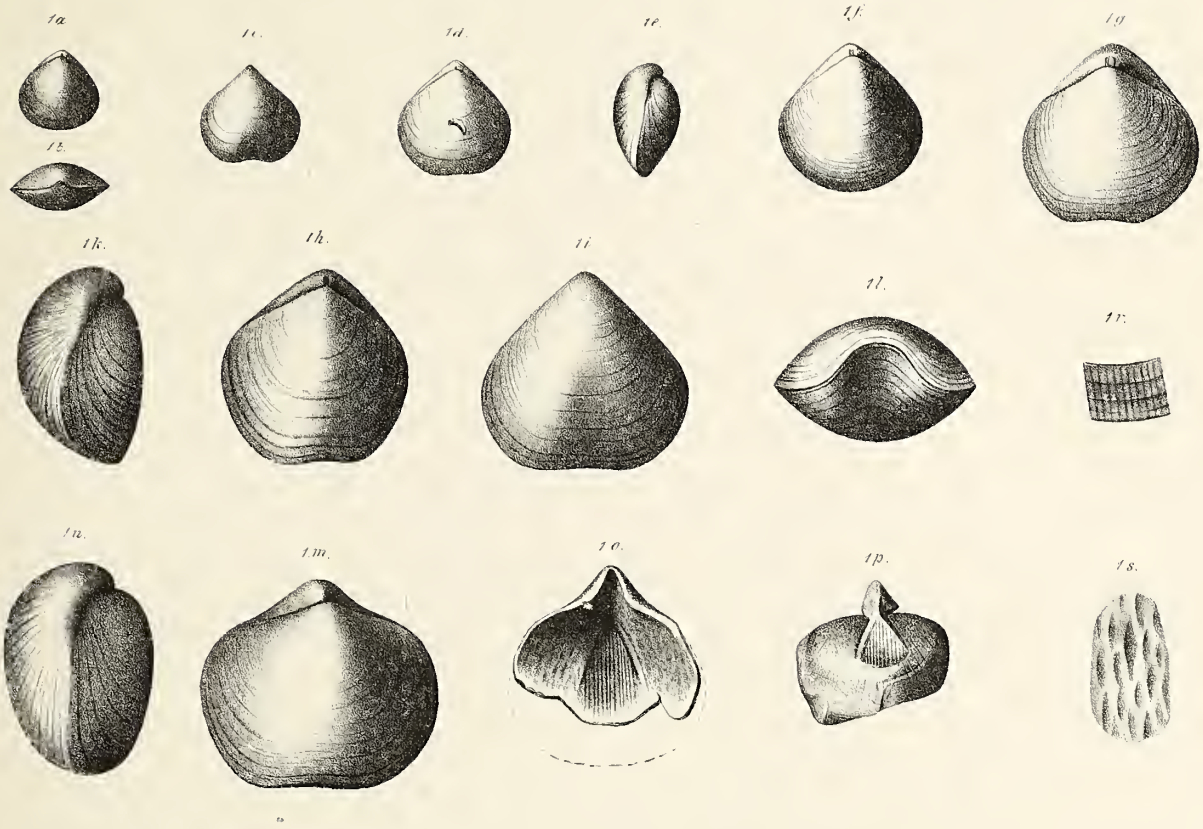
2 *c*, *d*. Casts of the ventral valve, showing some differences in the form of the muscular impressions, and the portions filling the cavity of the beak. The radiating striæ are partially preserved on fig. 2 *c*.

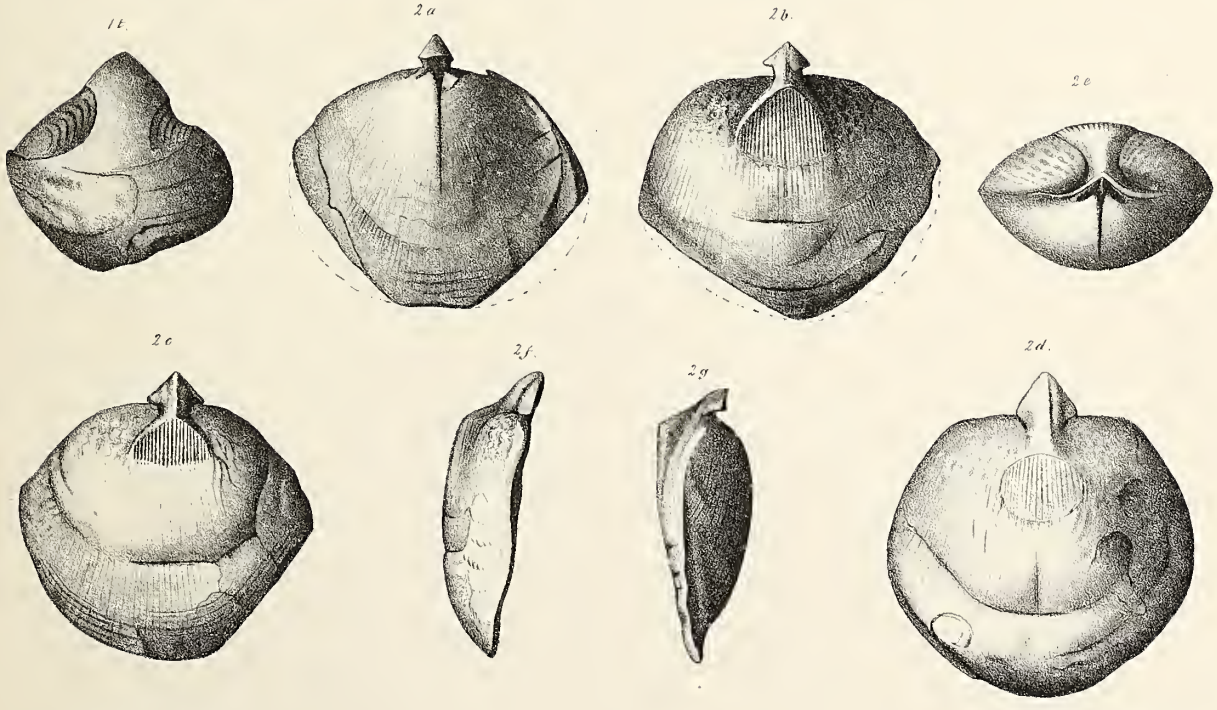
2 *e*. Cardinal view of a well-preserved cast.

2 *f*, *g*. Profile views of 2 *d* and 2 *c* respectively; the specimens 2 *c*, *g* preserving the cast of both valves, 2 *d*, *f* being the ventral valve only.

Shaly Limestone.

BRACHIOPODA.

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# PLATE 42.

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Fig. 1 *a* – *r*. ATRYPA RETICULARIS.

1 *a*, *b*, *c*, *d*. Ventral and profile views of young specimens.

1 *e*. Dorsal view of the ordinary form of large individuals.

1 *f*, *g*, *h*. Dorsal, front and profile views of a specimen from the Upper Pentamerus limestone.

1 *i*, *k*, *l*. Dorsal, ventral and profile views of an elongate or ovoid form of this species.

1 *m*. Interior of the dorsal valve.

1 *n*. Interior of the ventral valve, showing the teeth, muscular area, and the vascular impressions.

1 *o*. The ventral valve of a smaller individual.

1 *p*. A specimen with the dorsal valve partially broken away, showing the internal spires, which, by mistake of the lithographer, are represented as one.

1 *r*. Front view showing the arrangement of the spires.

Shaly Limestone.

BRACHIOPODA

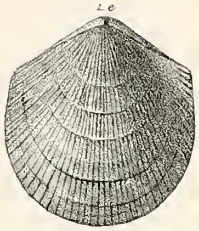
1 a.

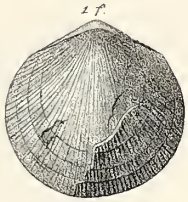
1 b.

1 c.

1 d.

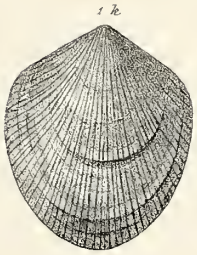
1 h.

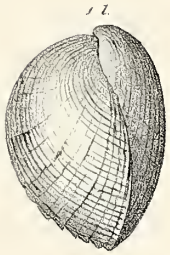

1 e.


1 f.

1 g.

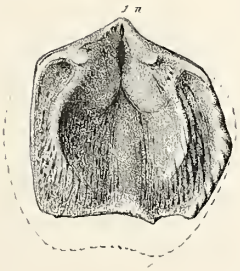
1. i.


1 k.


1 l.

1 p.

1 m.


1 n.

1 o.

1 r.

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# PLATE 43.

Page

Fig. 1 *a* – *m*. RHYNCHONELLA VENTRICOSA. 238

1 *a*, *b*, *c*. Dorsal, ventral, and profile views of a specimen of ordinary size and proportions.

1 *d*. Front view of the same specimen.

1 *e*, *f*, *g*, *h*. Dorsal, ventral, and profile views of more ventricose specimens.

1 *i*, *k*. Profile and front views of an extremely ventricose specimen.

1 *l*. Dorsal view of a more elongate form than usual.

1 *m*. Enlargement of the plications, showing impressed lines and strong striæ in front of the shell.

Fig. 2 *a* – *l*. RHYNCHONELLA CAMPBELLANA. 239

2 *a* – *e*. Ventral, dorsal, profile, and front views of young specimens.

2 *f*, *h*. Dorsal and profile views of an individual of full size.

2 *g*, *i*. Ventral and front views of an individual of full size, which is broader in the middle than usual.

2 *k*. Enlargement of several plications of the front of the ventral valve.

2 *f*. A cast of the ventral valve [ the letter *f* should be *l* ].

Fig. 3 *a* – *l*. RHYNCHONELLA NOBILIS. 240

3 *a*, *b*. A young specimen with a scarcely defined sinus.

3 *c*, *d*, *e*. *f*. Dorsal, ventral, front, and profile views of an individual of medium size.

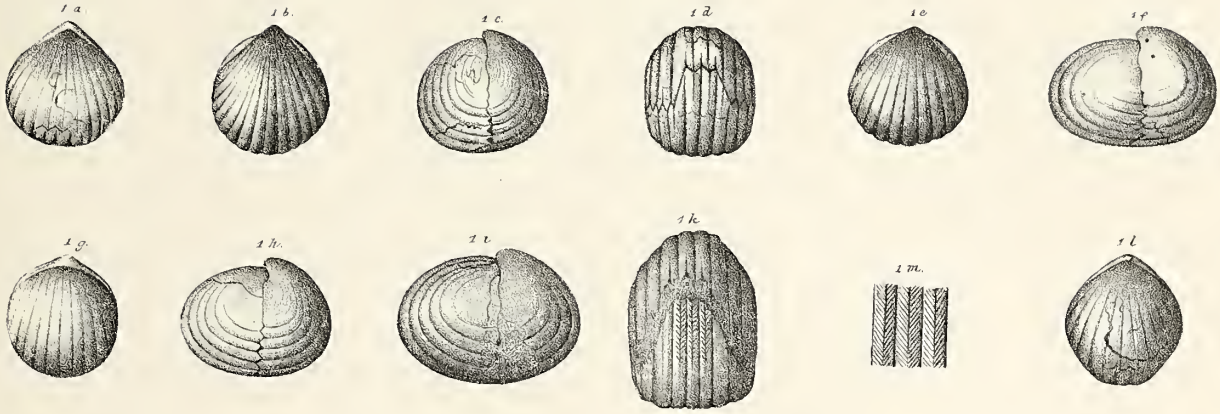
3 *g*, *h*. Dorsal and front views of a larger and more gibbous specimen.

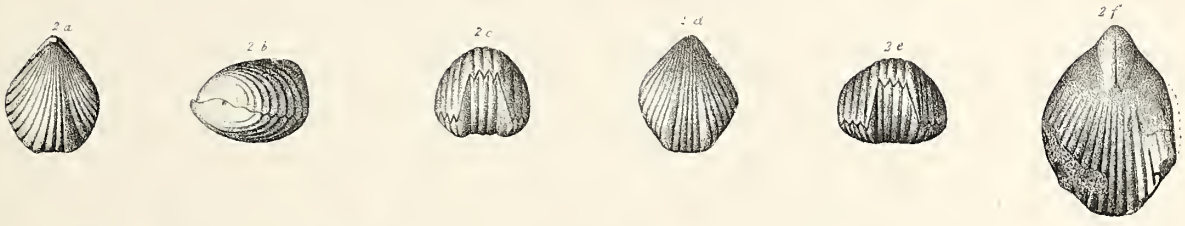
3 *i*, *k*. Dorsal and front views of the largest and most ventricose form that has been observed.

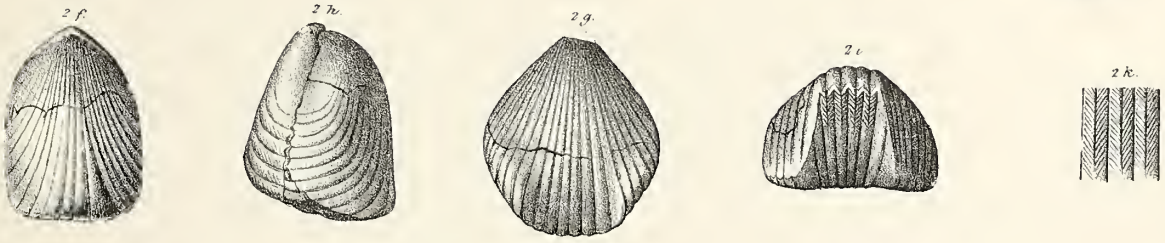
3 *l* [ by error marked 3 *b* ]. A cast of the ventral valve of this species.

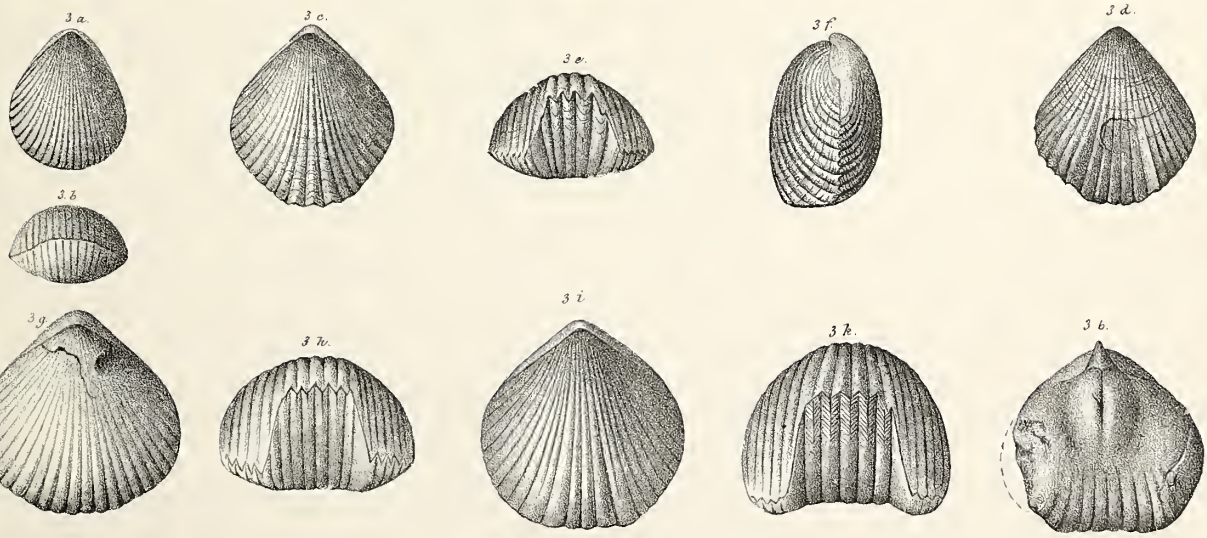
upper Pentamerus Limestone.

BRACHIOPODA

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# PLATE 44.

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Fig. 1 – 5. MERISTA ( = MERISTELLA? ) PRINCEPS. 251

1 *a*, *b*; 2 *a*, *b*, and 3 *a*, *b*, *c*. Ventral, dorsal, profile, and front views of young individuals, where the sinus is scarcely defined beyond the front, and there is no mesial fold on the dorsal valve. These specimens preserve so much the character of *Merista lævis*, that I have some hesitation in placing them under this species; but they are more extended in front, and the outline less regularly curved.

4 *a*, *b*, *c*, *d*. Dorsal, ventral, profile and front views, in which the characteristic features of the species are fully developed.

4 *e*, *f*, *g*, *h*. Views of a specimen of extremely large size, showing the broad and shallow mesial sinus, and the linguiform extension in front, which is bent abruptly upwards.

5 *a*, *b*, *c*, *d*. Views of a specimen having the form of the two preceding, but with a narrower and more angular sinus.

Fig. 6 *a*, *b*, *c*, *d*. MERISTA MEEKI. 252

6 *a*, *b*. Ventral and dorsal views of this species.

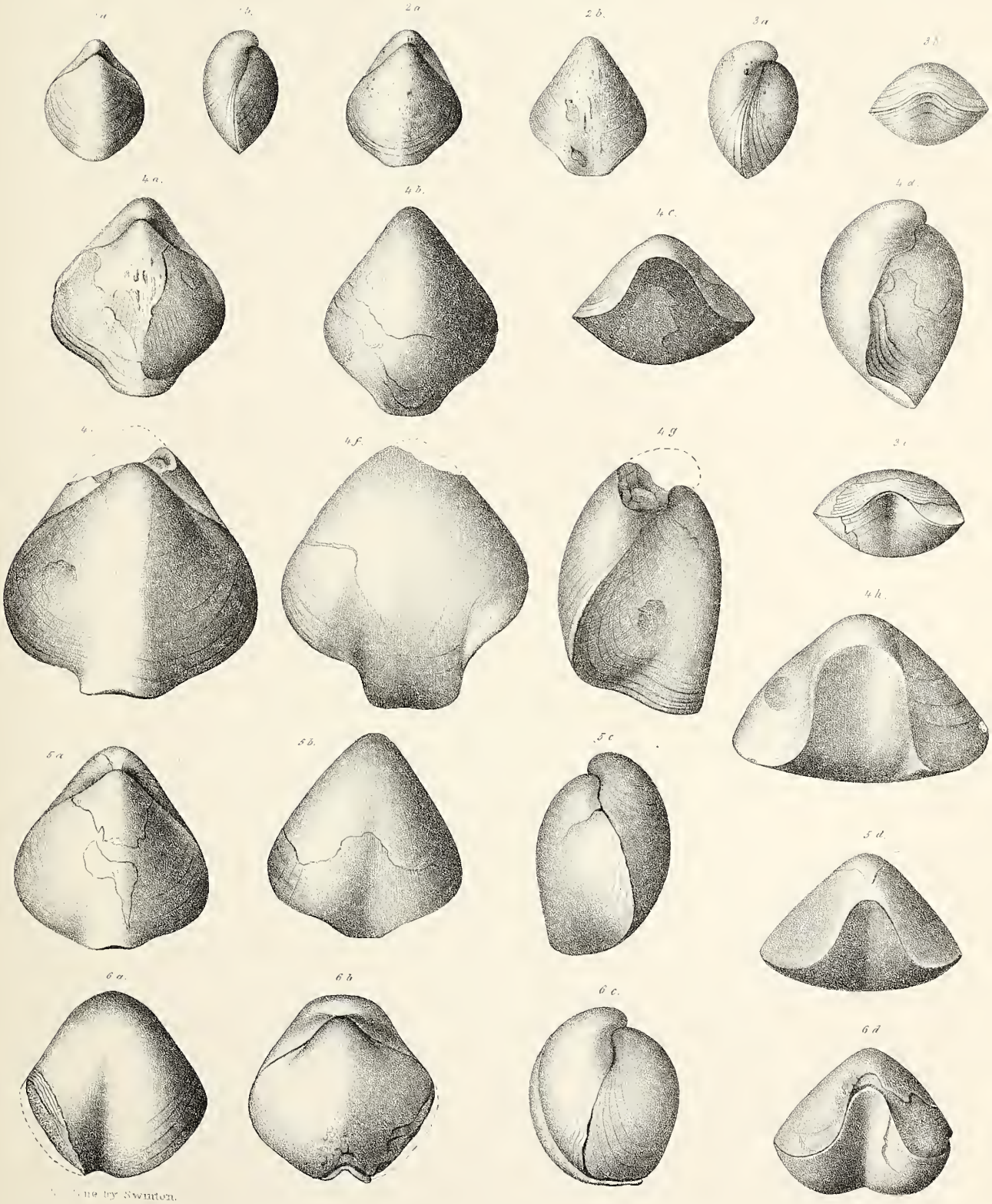
6 *c*, *d*. Profile and front views of the same.

LOWER HELDERBERG GROUP.

Shaly Limestone



BRACHIOPODA.

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Lith of Richd H. Pease Albany.

# PLATE 45.

Page

Fig. 1. MERISTA ( = MERISTELLA), species undetermined. 252

This species, of the size of 1 *a* and more rarely of 1 *b*, *c*, occurs in considerable numbers in the Upper Pentamerus limestone, and 1 *d* has the same form and proportions; but I have not been able to determine fully its relations to the other species described, or whether it may be the extreme young of *M. princeps*.

Fig. 2 *a* – *p*. RENSSELÆRIA MUTABILIS. 254

2 *a*, *b*. Dorsal and profile views of a young specimen.

2 *c*. Dorsal view of a large specimen, where the beak is scarcely incurved.

2 *d*, *e*, *f*, *g*. Specimens presenting the ordinary characters of the species.

2 *h*, *i*. Dorsal and profile views of a more elongated form, which is slightly wider towards the upper part of the shell.

2 *k*, *l*, *m*. Dorsal, profile and front views of a very gibbous specimen.

2 *n*, *o*, *p*. Views of specimens which are much broader towards the upper part of the shell, very gibbous, and having the beak closely incurved.

Fig. 3 *a* – *g*. RENSSELÆRIA ÆQUIRADIATA. 255

3 *a*, *b*, *c*. Dorsal, ventral and profile views of a large specimen, which is proportionally longer than the prevailing forms.

3 *d*. Front view of the same.

3 *e*, *f*, *g*. Dorsal, ventral and front views of a larger specimen, which has a proportionally greater breadth than the preceding.

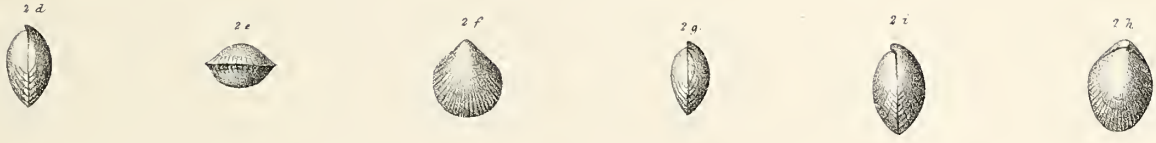
Fig. 4. RENSSELÆRIA ELLIPTICA. 256

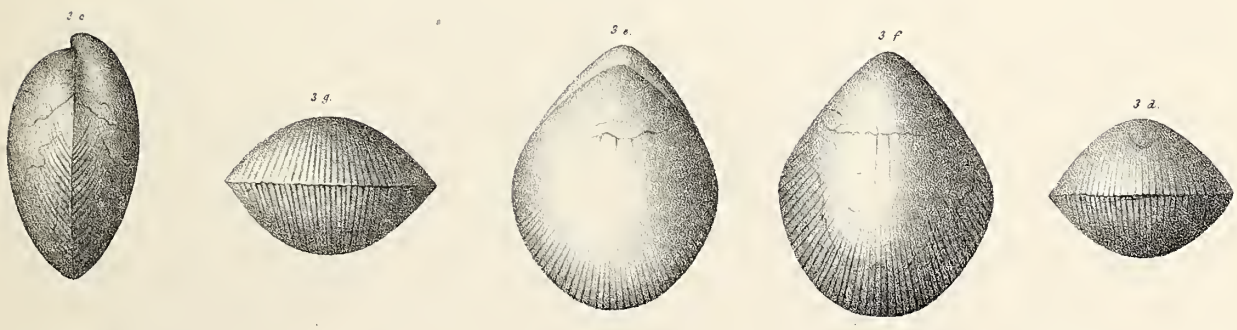
4 *a*, *b*, *c*. Dorsal, profile and front views of the same specimen.

# LOWER HELDERBERG GROUP.

D. Shaly and upper Pentamerus Limestone.

BRACHIOPODA



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# PLATE 46.

Page

Fig. 1 *a* – *z*. PENTAMERUS GALEATUS. 257

1 *a*, *b*, *c*. Young shells which are free from plications.

1 *d*, *e*, *f*. Views of a young specimen which has become very gibbous, and with plications strongly developed upon the mesial fold.

1 *g*, *h*, *i*. Three figures of half-grown individuals, showing the different degrees of development in the plications.

1 *k*, *l*. Dorsal and front views of a large specimen, in which no plications are developed. The surface presents well-marked concentric striæ, and obscure longitudinal striæ on the ventral valve.

1 *m*. A dorsal valve which is strongly plicate, but shows no mesial sinus.

1 *n*, *o*. Specimens showing the plications developed upon the mesial portion of the shell in very different degrees of strength.

1 *p*. Profile of the specimen 1 *o*.

1 *q*, *r*, *s*. Dorsal, profile and front views of a specimen having plications only on the mesial fold and sinus.

1 *t*, *u*. Dorsal views of specimens with plications developed over the entire surface of the valves; the one with, and the other without a mesial sinus.

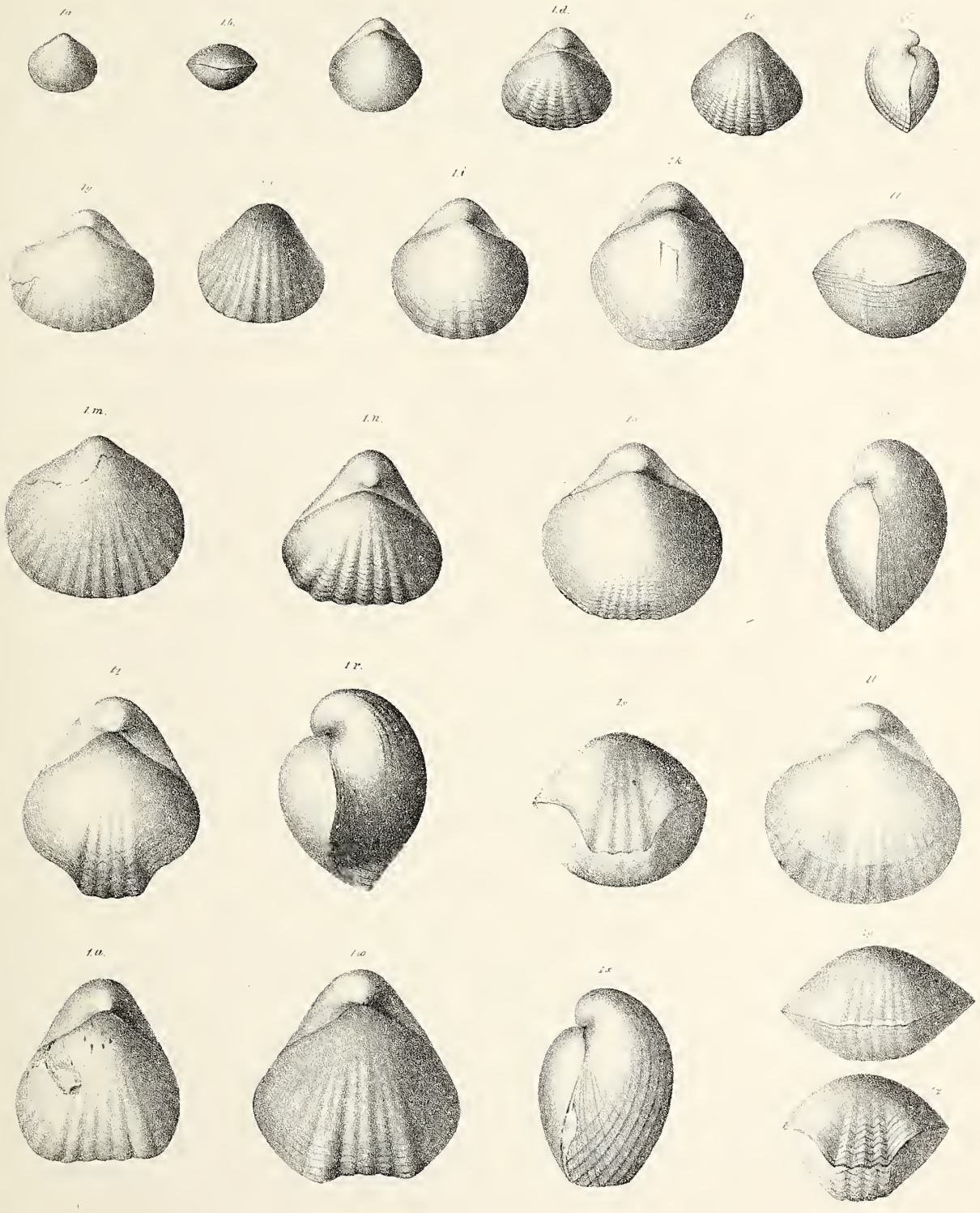
1 *w*. An individual showing bifurcating and coalescing striæ.

1 *x*. Profile of the specimen 1 *w*.

1 *y*, *z*. Front views of specimens, the one with and the other without a mesial sinus.

Pentamerus and D. Shaly Limestone.

BRACHIOPODA.



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# PLATE 47.

Page

Fig. 1 *a* – *m*. PENTAMERUS GALEATUS. 257

1 *a*. A specimen having the beak of the dorsal valve broken off, showing the triangular eavity beneath the beak of the opposite valve.

1 *b*, *c*. Ventral valves of this fossil : the one filled with stone, showing only the triangular eavity A; and the other having the stone removed by weathering, showing the eavity A and the septum B, presenting the eommon eharaeter of this fossil as seen upon the weathered surface of the Lower Pentamerus limestone of the Lower Helderberg group.

1 *d*. Dorsal valve, showing the entire extent of the cavity formed by the dental lamellæ, and the central septum below.

1 *e*. Lateral view where portions of both valves are removed, showing the extent of the dental lamellæ or spoonshaped eavity A as shown in fig. 1 *d*, the central septum of the ventral valve B, and one of the septa D of the dorsal valve, whieh beeomes free at its extremity.

1 *f*. Interior of the hinge : E, E, the line of junction of the two valves. The septa of the upper or dorsal valve eorrespond to the extension of the dental lamellæ or sides of the spoonshaped eavity in the lower or ventral valve.

1 *g*. Dorsal view of a cast, showing the septa D, D; the cast of the triangular cavity beneath the beak of the ventral valve A.

1 *h*. Cardinal view of the same, showing the form of the cast filling the triangular eavity beneath the beak A, and its extension below into the central septum, which in the cast divides the valve into two parts. The lines of the two longitudinal septa of the dorsal valve are marked D, D, as in the preeeding figure.

1 *i*. Cast of the ventral valve, showing the longitudinal septum B.

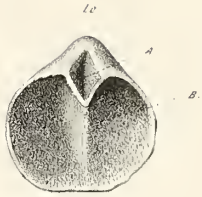
1 *k*, *l*, *m*. Profile, ventral and front views of an extravagant speeimen whieh shows bifurcating plieations upon the mesial sinus and fold.

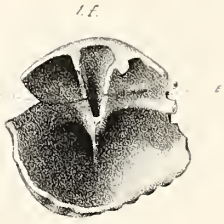
# LOWER HELDERBERG GROUP.

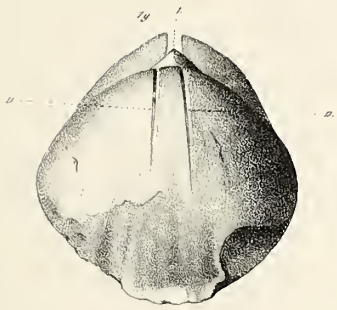
Pentamerus and D. Shaly Limestone.

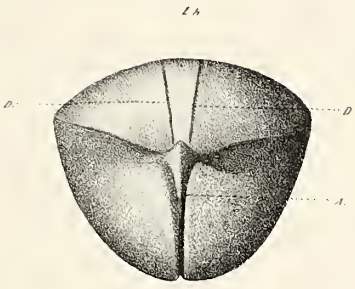
PL. 47.

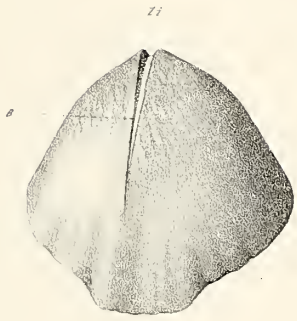
BRACHIOPODA.

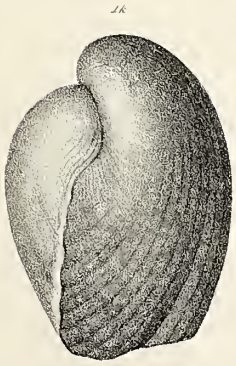


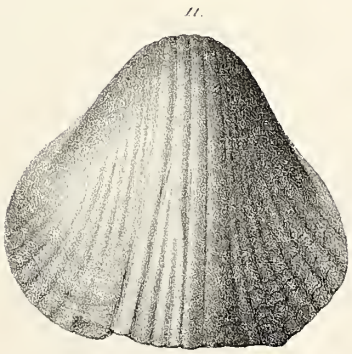


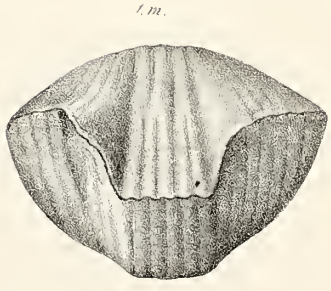

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# PLATE 48.

Page

Fig. 1 *a* – *y*. PENTAMERUS VERNEUILI (n. s.). 260

1 *a*, *b*. Ventral and front views of a young specimen.

1 *c*, *d*. Dorsal and profile views of a specimen larger than the preceding.

1 *e*. The cardinal view of 1 *c*, *d* enlarged, showing the triangular foramen and apparent area.

1 *f*. Dorsal valve of a finely plicated specimen.

1 *h*. The same enlarged, to show the regularly intercalated smaller plications.

1 *g*. Ventral view, showing the bifurcating plications.

1 *i*, *k*, *l*. Ventral, dorsal and profile views of a specimen with simple coarse plications.

1 *m*. Front view of a specimen similar to the preceding.

1 *n*, *o*, *p*. Ventral, profile and front views of a large specimen which preserves the prevailing character of the species. The profile view shows the incurved dorsal beak, and the nearly straight ventral beak, a little separated.

1 *r*. Cardinal view, showing the short accessary plications which mark the lateral areas.

1 *s*. Profile view of another specimen, showing the beaks of the two valves in contact, the usual condition of the shell.

1 *t*. Interior of the dorsal valve, showing the two longitudinal septa and the broad brachial processes at the hinge line.

1 *u*. Interior of the ventral valve, showing the elongate spoonshaped cavity, with the lateral lobes and the slight extension of the central septum.

1 *x*. The same enlarged, showing the muscular imprints at the base of the cavity.

1 *v*. Interior of the two valves in connexion, showing the triangular cavity and central septum below and the double septa above with the lamellæ, which extend far into the interior of the upper or dorsal valve.

1 *y*. Longitudinal section of the dorsal valve, showing the comparative extent of the spoon-shaped cavity and the narrow short septum below.

Fig. 2 *a* – *l*. PENTAMERUS PSEUDOGALEATUS (n. s.). 259

2 *a*, *b*, *c*, *d*. Dorsal, profile and front views of young individuals.

2 *e*. Dorsal view of a specimen of medium size.

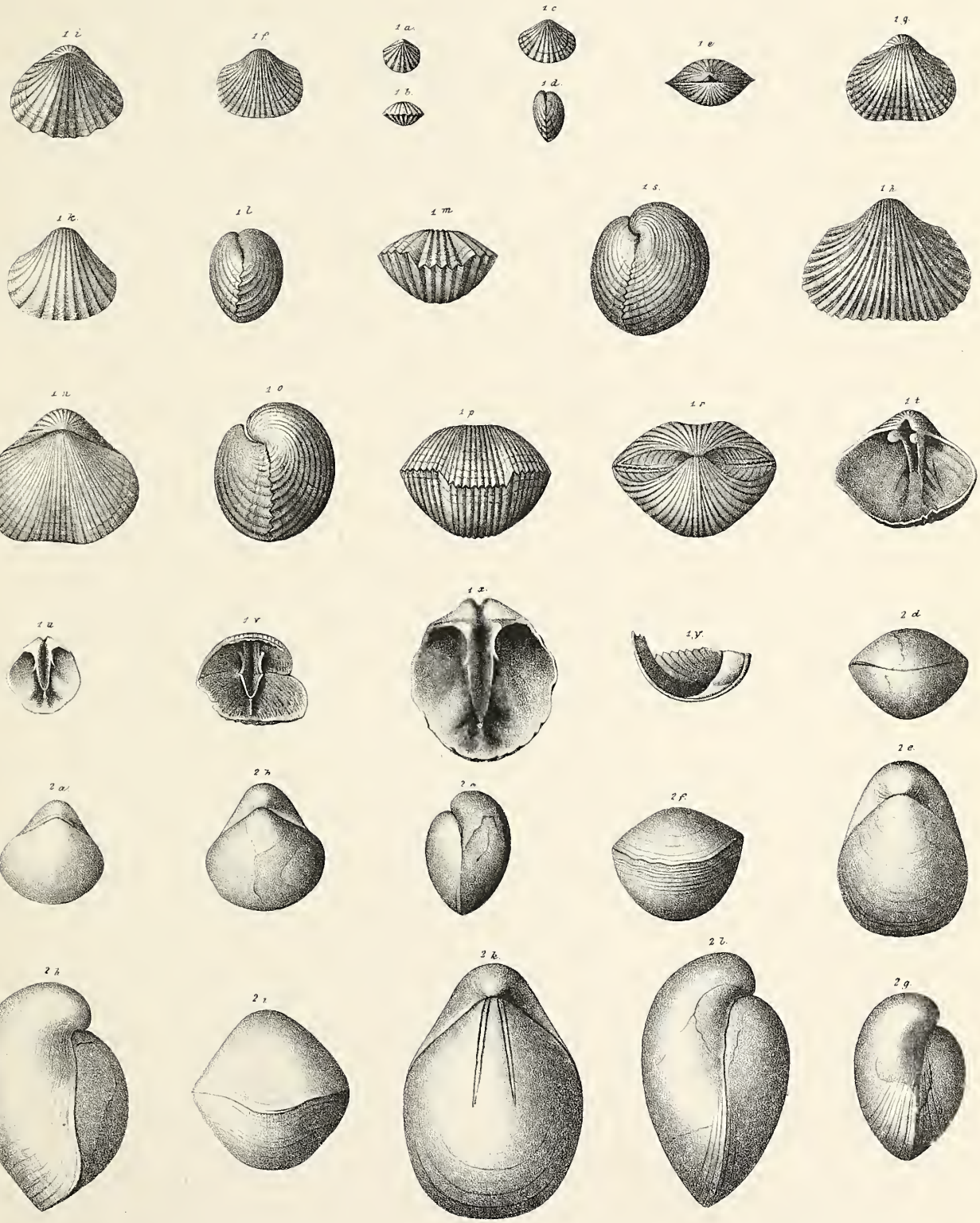
2 *f*, *g*. Front and profile views of the same specimen.

2 *h*, *i*. Profile and front views of a very gibbous specimen, which represents the character of the ordinary full-grown individual.

2 *k*, *l*. Dorsal and profile views of an unusually large specimen from which the shell is partially exfoliated, showing the two septa of the dorsal valve.

D Shaly and upper Pentamerus Limestone

BRACHIOPODA

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# PLATE 49.

Page

Fig. 1. TELLINOMYA NUCLEIFORMIS. 263

1. A east of the left valve.

Fig. 2 *a* – *e*. MODIOLOPSIS? DUBIUS. 264

2 *a*. The right valve of a speeimen whieh is slightly imperfeet at the posterior extremity.

2 *b*. Cardinal view of the same. The apparent gaping at the posterior extremity is due to imperfeetion of the speeimen.

2 *c*. The right valve of this speeies.

2 *d*. The left valve of a larger individual.

2 *e*. A fragment of limestone preserving the separated valves of several individuals.

Fig. 3 *a* – *d*. ANATINA? SINUATA. 265

3 *a*. The right valve? of a speeimen in whieh the two extremities are imperfeet.

3 *b*. Cardinal view of the same. The eompression of the anterior extremity is not distinetly represented.

3 *c*. The right valve? of a speeimen from whieh the shell is nearly exfoliated, and the beaks broken off.

3 *d*. Profile view of the same

Fig. 4. MEGAMBONIA SUBORBICULARIS. 273

4 *a*. The left side of the east, showing the museular impression.

5 *b* (by error for 4 *b* on plate). Profile view from the posterior side.

Fig. 5. MEGAMBONIA SPINNERI. 274

5 *a*. The left side of the east, showing the form, the museular sear, and elevation of the beak.

4 *b* (by error for 5 *b*). Profile view from the posterior side.

5 *c*. Cardinal view, showing the prominenee of the museular sears.

Fig. 6. AVICULA OBSCURA. 280

6. Interior of a right valve, having the anterior wing nearly obliterated, and the other broken off at some distanee from the extremity.

Fig. 7 & 8. MEGAMBONIA AVICULOIDEA. 274

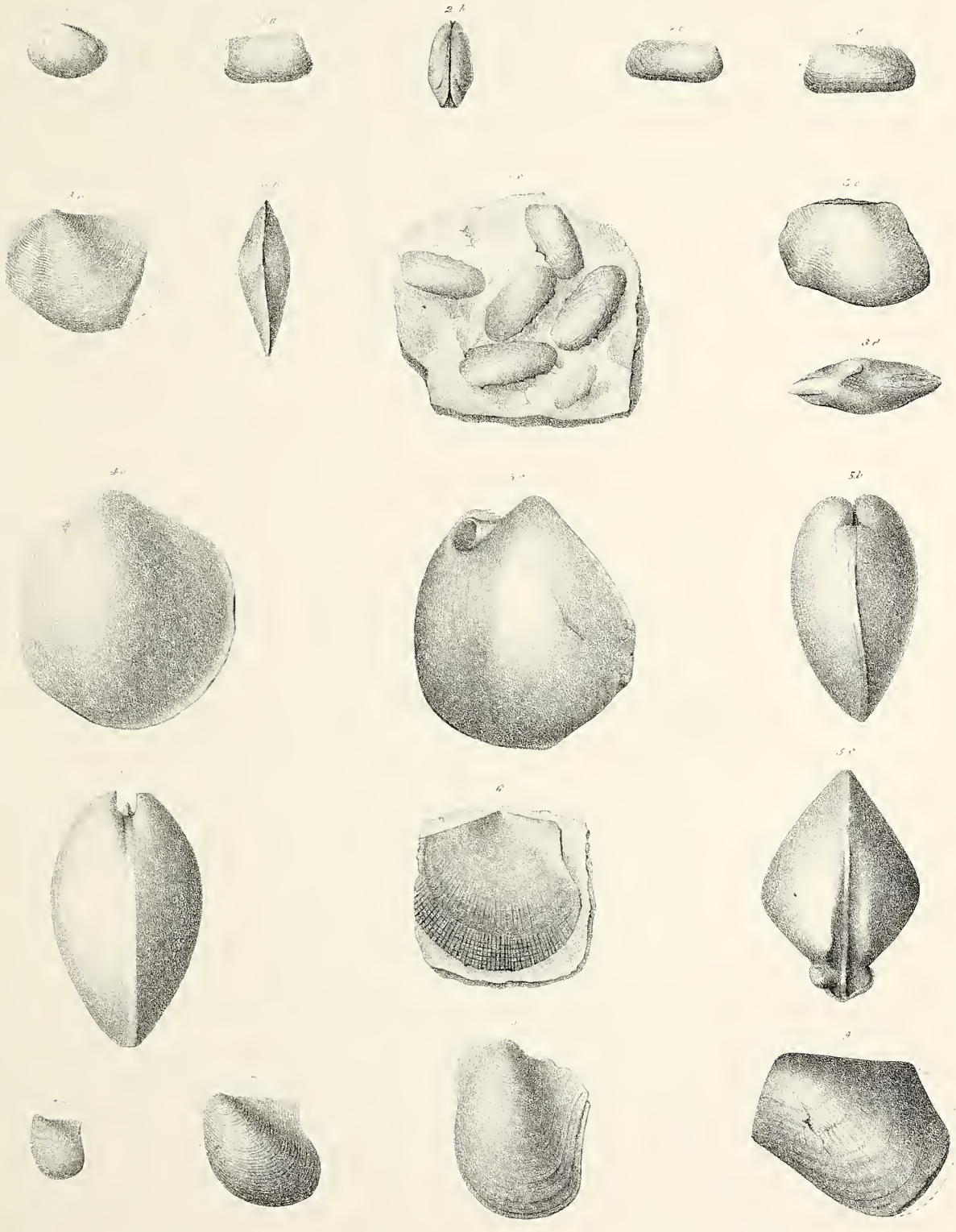
7 *a*. The left valve of a young shell.

7 *b*. The left valve of a larger individual.

8. A full-grown? individual preserving in part the auterior and posterior extensions, the shell being removed from the eentral prominent part of the fossil.

Fig. 9. MEGAMBONIA RHOMBOIDEA. 275

9. The left valve, imperfeet at the posterior side, and also at the anterior side, though the latter is not shown in the figure.



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# PLATE 49 A.

Page

Fig. 1. CYPRICARDINIA LAMELLOSA. 266

1 *a*. A specimen, natural size.

1 *b*. The same enlarged to nearly three diameters.

1 *c*. Cardinal view of the same enlarged.

Fig. 2. CYPRICARDINIA DORSATA. 267

2. The right valve of this species.

Fig. 3. MEGAMBONIA MYTILOIDEA. 276

3 *a*. The right valve of the specimen.

3 *b*. Profile view of the same.

Fig. 4. MEGAMBONIA OVOIDEA. 276

4 *a*. The left valve of the specimen.

4 *b*. Profile of the same, looking upon the cardinal line; the beak of the right valve broken off.

Fig. 5. MEGAMBONIA SUBORBICULARIS. 273

5. A cast of the left valve of this species.

Fig. 6. AVICULA SUBEQUILATERA. 281

6. The left valve of this species.

Fig. 7. MEGAMBONIA OBSCURA. 277

7. The right valve of the specimen.

Fig. 8. MEGAMBONIA AVICULOIDEA. 274

8. The left valve of a specimen of this species.

Fig. 9. AVICULA [?] NAVIFORMIS. 279

9 *a*. A left valve preserving the entire form, with some remains of the shell, showing the concentric lamellose markings and the radiating striæ.

9 *c*. A larger individual in which the radiating striæ are scarcely shown.

9 *b*. A large individual, in which the shell is better preserved than in the other specimens: the umbo is proportionally less elevated, and the continuity of the hinge-line is interrupted or obscured by the surrounding stone. The radiating striæ are a little too strong in the figure.

# LOWER HELDERBERG GROUP

(TENTACULITE AND PENTAMERUS LIMESTONE)

(LAMELLIBRANCHIATA.)

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1 a.

1. b.

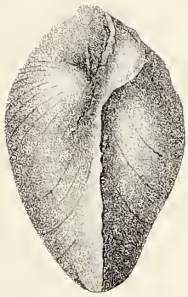
1. c.

3 b.

3. a.

4 a.

5.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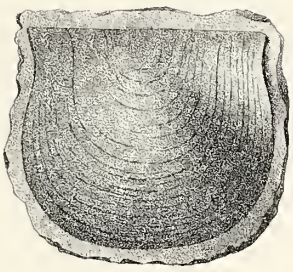
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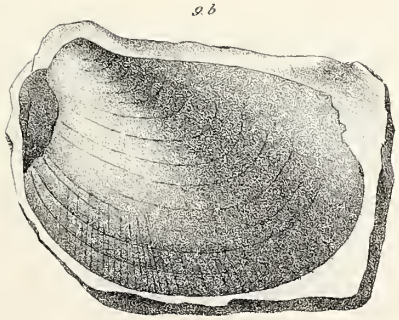
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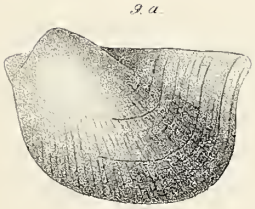
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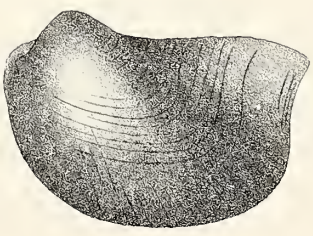
9 c.

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# PLATE 50.


Page

Fig. 1. CYPRICARDINIA SUBLAMELLOSA. 267

1. The right valve, natural size.

Fig. 2. CYPRICARDINIA CONCENTRICA. 268

2. The right valve of this species.

Fig. 3. CYPRICARDINIA CRASSA. 268

3. The right valve, natural size. The posterior side is somewhat broken and obscure.

Fig. 4. MEGAMBONIA LATA. 277

4. The left valve of this species.

Fig. 5. MEGAMBONIA OBLONGA. 277

5. The left valve of this species.

Fig. 6. MEGAMBONIA CORDIFORMIS. 278

6 *a*. Profile view from the anterior side of the shell.

6 *b*. View of the right valve, having the posterior cardinal extension abraded.

Fig. 7. MEGAMBONIA OVATA. 279

7. The cast of the right valve.

# D. SHALY LIMESTONE.

(ACEPHALA.)



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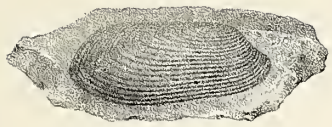

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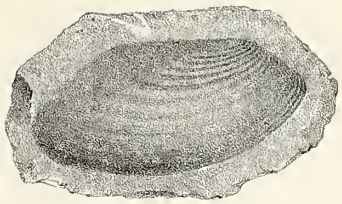

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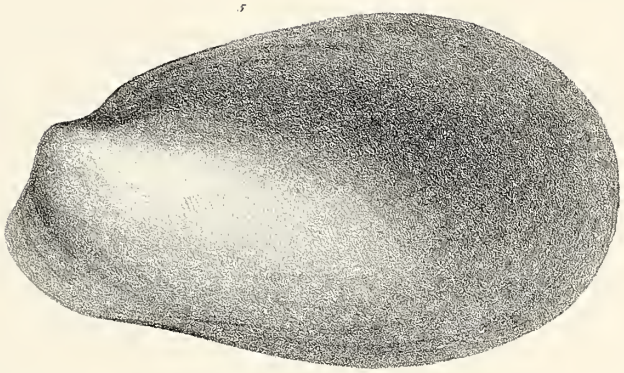

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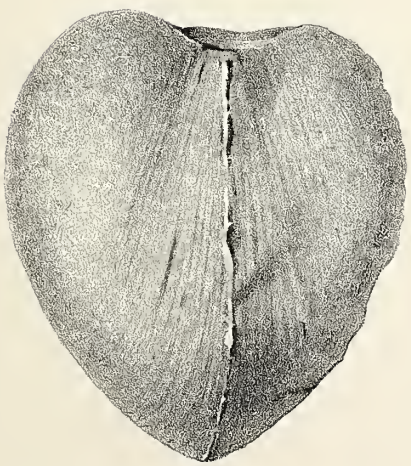
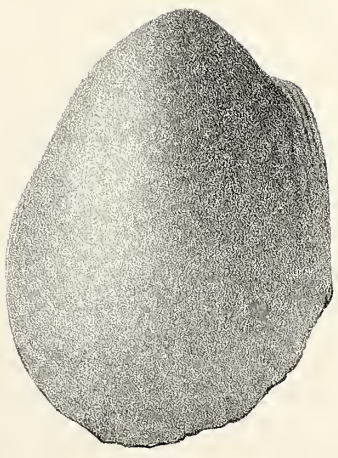


6.b.



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# PLATE 51.

Page

Fig. 1 & 2. AVICULA TENUILAMELLATA. 281

1. The right valve, having the shell nearly exfoliated.
2. The left valve of the same species, preserving some small fragment of the shell.

Fig. 3 & 4. AVICULA SPINULIFERA. 282

3. The interior of the right valve, from which the posterior wing is nearly removed.
4. The impression or mould of the exterior surface of the left valve of the same species.

Fig. 5. AVICULA SCHOHARIÆ. 283

5. Left valve of this species. The line apparently corresponding to the anterior wing in the the figure is an accidental ridge in the stone.

5 *a*. Enlargement of a portion of the surface, to show the round radiating striæ and distant lamellose lines of growth.

Fig. 6. AVICULA UMBONATA. 284

6. The left valve, having the posterior wing broken off.

Fig. 7 & 8. AVICULA MANTICULA. 284

7. The left valve of this species.
8. The left valve of a smaller individual.

Fig. 9 & 10. AVICULA OBLIQUATA. 285

9. The interior of the left valve, showing obscurely the external costæ. [From imperfection in the specimen, the sinus in the external margin, between the wing and the body of the shell, is represented as too abrupt.]
10. A cast of the valve, which preserves only the remains of the concentric striæ.

Fig. 11. AVICULA ÆQUIRADIATA. 285

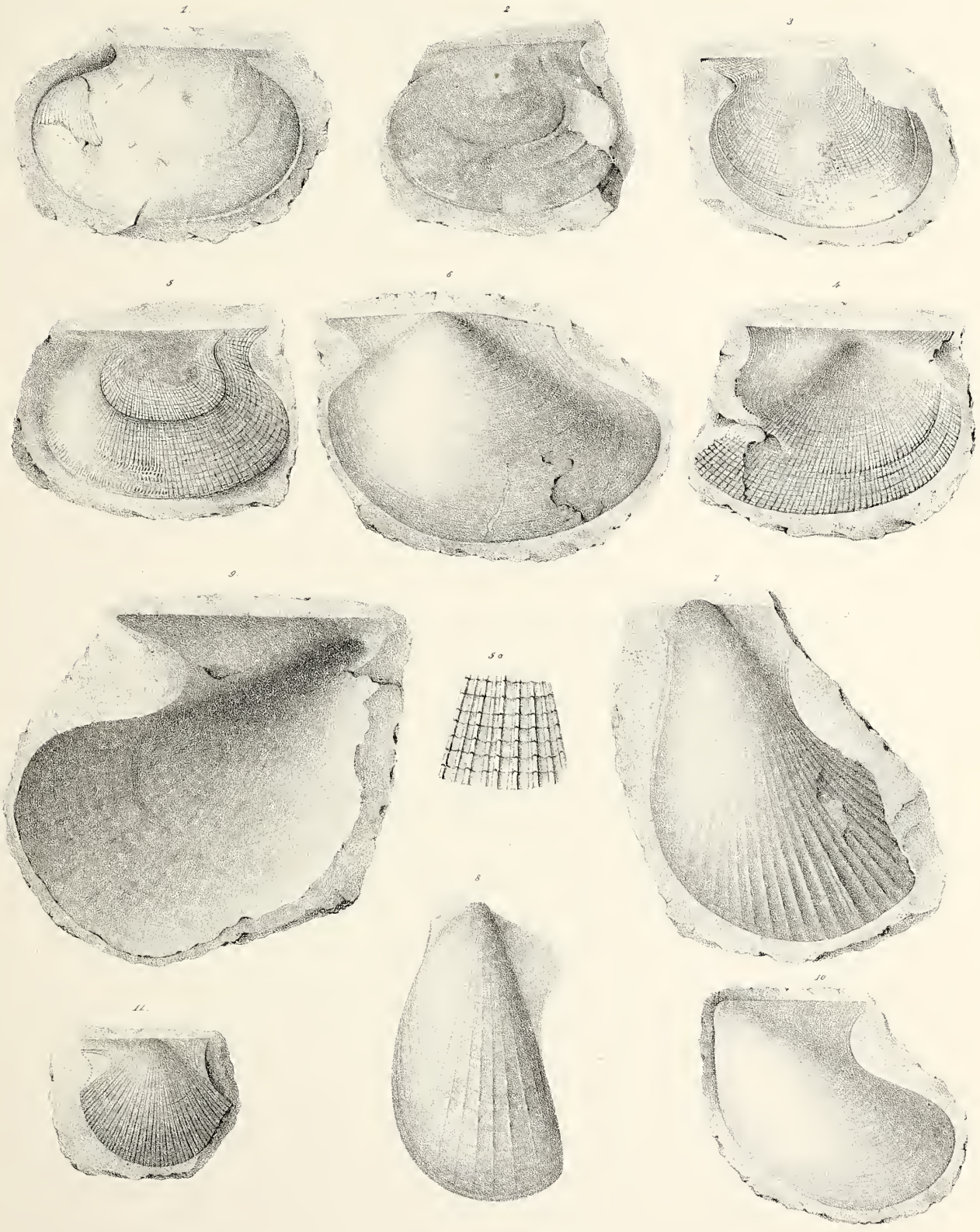
11. An imperfect specimen of the left valve.

# LOWER HELDERBERG GROUP.

(Pentamerus and Shaly Limestone.)

(LAMELLIBRANCHIATA)



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Swinton, lith.

# PLATE 52.

Page

Fig. 1 – 7. AVICULA COMMUNIS. 286

1. A cast of the left valve which has been transversely compressed, elevating the anterior and depressing the posterior wing. The radii are pretty regularly interrupted by the concentric striæ.
2. A smaller individual in which the shell is well preserved, showing the stronger and intermediate finer radii.
3. The interior of the left valve of a specimen of this species, in which the anterior wing is imperfect, as well as the cardinal margin of the posterior wing.
4. The cast of the interior of a smaller specimen, having the posterior side and extremity of the wing broken off.
5. The right valve, from which the shell has been partially removed. The radii are much more nearly equal, than on the opposite valve.
6. The interior of a smaller specimen, in which the radii are more equal.
7. A smaller individual (apparently of the same species), having the posterior side and base broken off, and the anterior side entire.

Fig. 8. AVICULA PAUCIRADIATA. 287

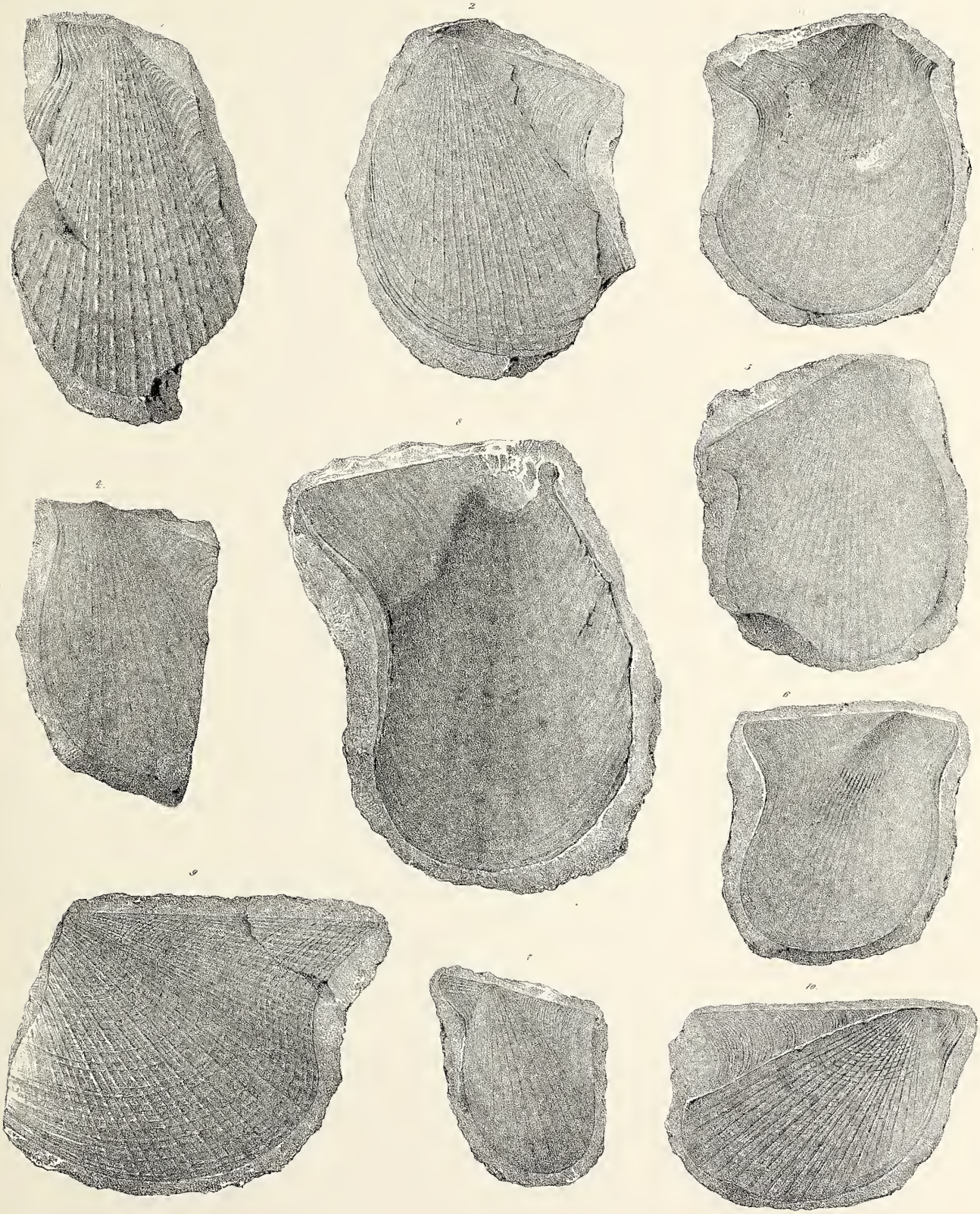
8. The interior of the specimen described.

Fig. 9, and 10? AVICULA TEXTILIS. 288

9. The left valve of this species, preserving the posterior wing and the greater part of the body of the shell, the anterior portion being broken off.

10? The interior of a left valve, which, in the general form and obliquity of the body of the shell, corresponds to this species, but the wing is shorter. The abrupt separation between the body of the shell and the wing may be due to pressure, which has produced a slight folding along that line.

(ACEPHALA.)



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# PLATE 53.

Page

Fig. 1, 4 & 6. AVICULA COMMUNIS. 286

1. A young shell of this species, which preserves the anterior and posterior wings entire, with the gibbous umbo and beak elevated above the hinge-line.

4. A specimen of medium size, which is very gibbous above the middle and at the umbo. The wing is erroneously represented as too pointed, by leaving out a portion which is obscurely visible on the posterior sinuate margin.

6. A similar specimen, in which the body of the shell is a little more oblique than usual. The posterior extension of the wing is broken off, so that the margin represented is not the natural one.

Fig. 2, 3, 5, 7 & 10. AVICULA TEXTILIS. 288

2. The right valve of a young shell which is imperfect, but, in the obliquity of the body and general form, corresponds to this species. It is moderately convex, a little gibbous on the umbo, and the surface of the shell shows subdued radii, while the wing shows only concentric markings as in *A. communis*.

3. The left valve of a young shell preserving the surface markings, with radiating striæ upon the wing, as in the larger specimens. The posterior part of the wing is broken off, so that the full extent is not shown in the figure.

5. The interior of the left valve of a shell of this species. In the figure, the sinus on the outer margin is too abrupt : a cast from this interior presents precisely the characters shown in fig. 9, Plate LII.

7. The left valve of a small specimen of this species : the anterior wing and beak are broken off, as well as a part of the posterior wing.

10. A cast of the left valve of this species, from which the shell has been exfoliated and the posterior and basal margins broken off. The specimen is a little more abruptly convex in the middle and upper part than usual in shells of this species.

Fig. 8 & 9. AVICULA BELLULA. 289

8. A specimen showing the two valves connected at the hinge.

9. The interior of a left valve of the same species.

Fig. 11 – 14. AVICULA SECURIFORMIS. 290

11. A specimen of the left valve, in which the proportions of length and height are nearly equal. The deep marginal sinuosity of the posterior wing is exaggerated, from imperfection in the specimen.

12. The left valve, preserving the form nearly entire; the upper part of the surface being exfoliated so as to obliterate the markings.

13. The specimen is apparently the inner side of the right valve, and is quite flat. The broad costæ represented are the elevated spaces between the external costæ, showing as depressions on the inside of the shell.

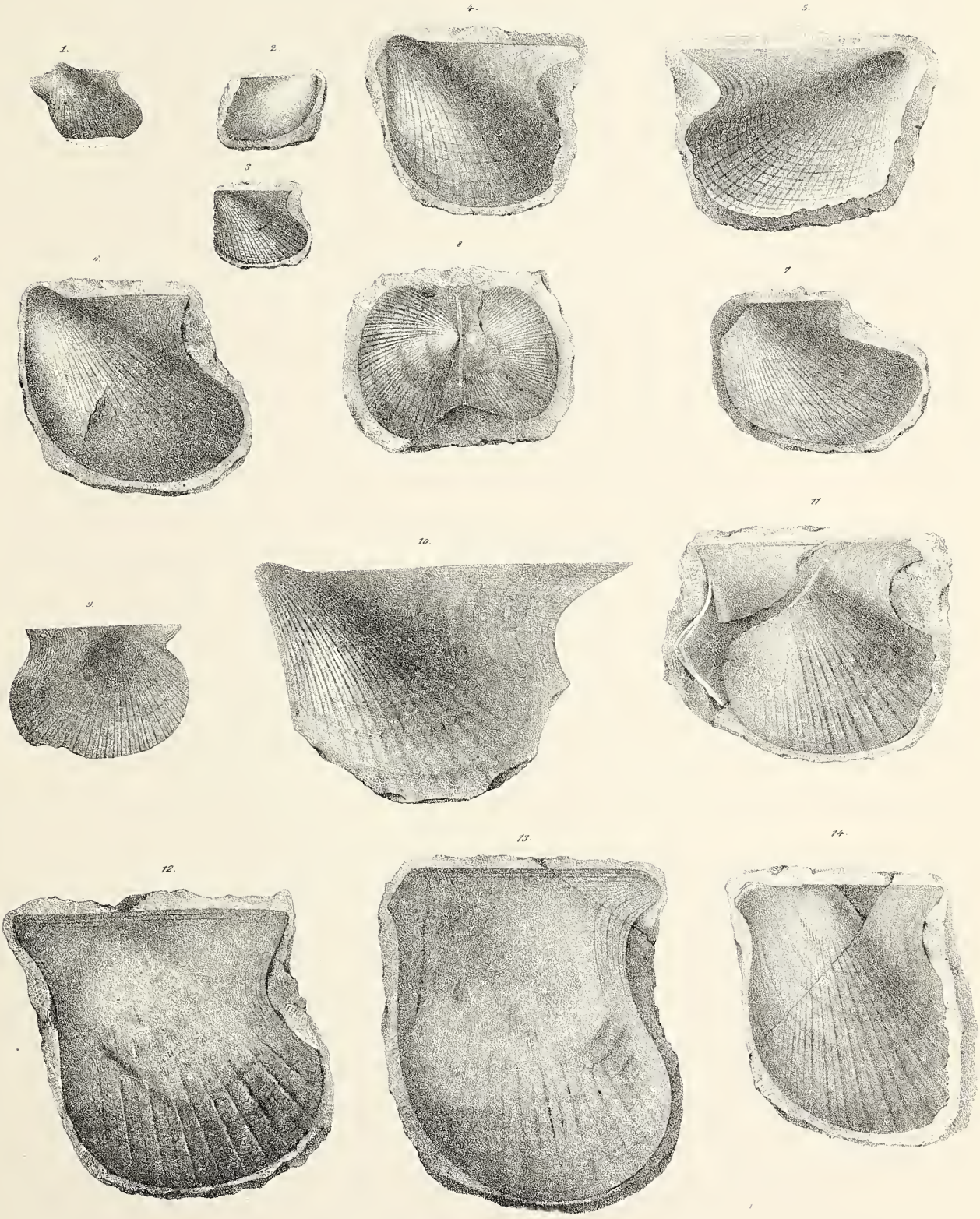
14. A partial cast of the left valve of this species.

# LOWER HELDERBERG GROUP.

Shaly Limestone.

(LAMELLIBRANCHIATA.)





# PLATE 54.

Page

Fig. 1. HOLOPEA SUBCONICA. 294

1 *a*. View showing the aperture, which is represented with peristome too much thickened.
1 *b*. The anterior side of the same.

Fig. 2 & 3. HOLOPEA ANTIQUA. 294

2 *a*. A cast of this species of the ordinary size.
2 *b*. A similar cast, which is a little more ventricose.
3 *a*. A cast of a larger specimen.
3 *b*. The anterior view of a larger individual. The apparent extension of the shell on the lower side is a misrepresentation by the artist.

Fig. 4 & 5. HOLOPEA ANTIQUA, *var.* PERVETUSTA. 295

4. A cast of this species.
5. A specimen retaining the shell.

Fig. 6 & 7. HOLOPEA? ELONGATA. 295

6. A section of a small individual shown on the worn surface of the rock.
7. A larger specimen which preserves some remains of the columellar lip, the upper volutions being entire.

Fig. 8. LOXONEMA ATTENUATA. 296

8. The posterior side of the cast, the aperture being filled with stone.

Fig. 9 & 11. LOXONEMA FITCHI. 296

9. Anterior side of a cast which is flattened in that direction.
11 *a*. A fragment of the same species from the shaly limestone.
11 *b*. A similar fragment of a larger individual.

Fig. 10. LOXONEMA? OBTUSA. 297

10. A longitudinal section of a specimen of this species upon the worn surface of the rock.

Fig. 12. LOXONEMA? COMPACTA. 297

12. A specimen from which the shell is exfoliated, preserving thirteen volutions with the apex imperfect.

Fig. 13. LOXONEMA PLANOGYRATA. 298

13. The anterior side of the specimen, the apex of which, as represented in the figure, preserves no marks of volutions.

Fig. 14. HOLOPEA DANAI. 295

14. Anterior view of the cast of this species.

Fig. 15 & 16. MURCHISONIA EXTENUATA. 298

15. Copied from a figure of Mr. CONRAD, which is cited as from the Tentaculite limestone of Fayetteville, Onondaga county.
16. A much worn specimen, which is perhaps of the same species.

Fig. 17. MURCHISONIA MINUTA. 298

17. Representations of the specimen, natural size and enlarged, from figures by Mr. CONRAD.

Fig. 18 *a* – *e*. SPIRORBIS LAXUS. 349

18 *a*. A fragment of stone, preserving numerous individuals of this species.
18 *b*. The upper side of the spire of a specimen, greatly enlarged.
18 *c*. The lower side, showing the round mouth and the umbilicus.
18 *d*. A specimen in which the last volution is free (a common condition of the species).
18 *e*. A specimen in which the apex is closely involved, and the remaining portions not contiguous. (This is an extreme form, and rarely seen.)

# LOWER HELDERBERG GROUP

(TENTACULITE AND PENTAMERUS LIMESTONES.)



(GASTEROPODA.)

F B Meek del

# PLATE 55.

Page

Fig. 1. STROPHOSTYLUS ELEGANS. 304

1 *a*. A small specimen which is imbedded in limestone.

1 *b*. A larger individual.

1 *c*. A larger specimen, the surface better preserved.

1 *d*. An enlarged figure, showing more distinctly the fine striæ and form of the shell.

Fig. 2. MURCHISONIA BILIRATA. 299

2. A fragment preserving two volutions.

Fig. 3. PLATYOSTOMA? SUBANGULATA. 301

3 *a*. A lateral view of the specimen.

3 *b*. View of the base of the same.

Fig. 4. PLATYOSTOMA DEPRESSA. 301

4 *a*. A lateral view of a small individual.

4 *b*. The lower side of a similar specimen. The umbilicate character is due to the removal of the columella; the opening being a cast, which preserves the impressions of the striæ.

Fig. 5 & 7. PLATYCERAS SINUATUM. 314

5. View looking upon the spire of a small specimen, showing the deep marginal sinuosity and the strong wrinkled surface.

7. A dorsal view of a larger individual which is compressed upon the outer volution, showing the narrow linear sinus near the aperture, which, from the bending of the striæ nearer the apex, must have been wider at that period of growth.

Fig. 6. PLATYCERAS GEBHARDI. 312

6 *a*. An enlargement of the spire of the specimen fig. 5, Plate LVI; showing the carination along the summit, and the abrupt bending of the striæ.

6 *b*. A still farther enlargement, showing the fine revolving striæ which cancellate the coarser transverse striæ, and the proportionate size of the two sets.

Fig. 8. STROPHOSTYLUS GLOBOSUS. 305

8. A cast of this species, preserving a fragment of the shell along the suture.

Fig. 9. PLATYOSTOMA VENTRICOSA. 300

9 *a*. View of a depressed-globose specimen, from which the shell is nearly removed.

9 *b*. View of the aperture of the same. [The figure does not properly represent the specimen.]

9 *c*. A globose specimen which preserves a fragment of the shell.

9 *d*. A worn specimen, showing a longitudinal section of the shell on one side of the centre.

Fig. 10 & 11. PLATYCERAS ROBUSTUM. 313

10. View of the spire of a large individual, showing the undulating striæ and the sinuosities of the right side of the aperture.

11 *a*. View of the aperture of a smaller specimen, which is a cast.

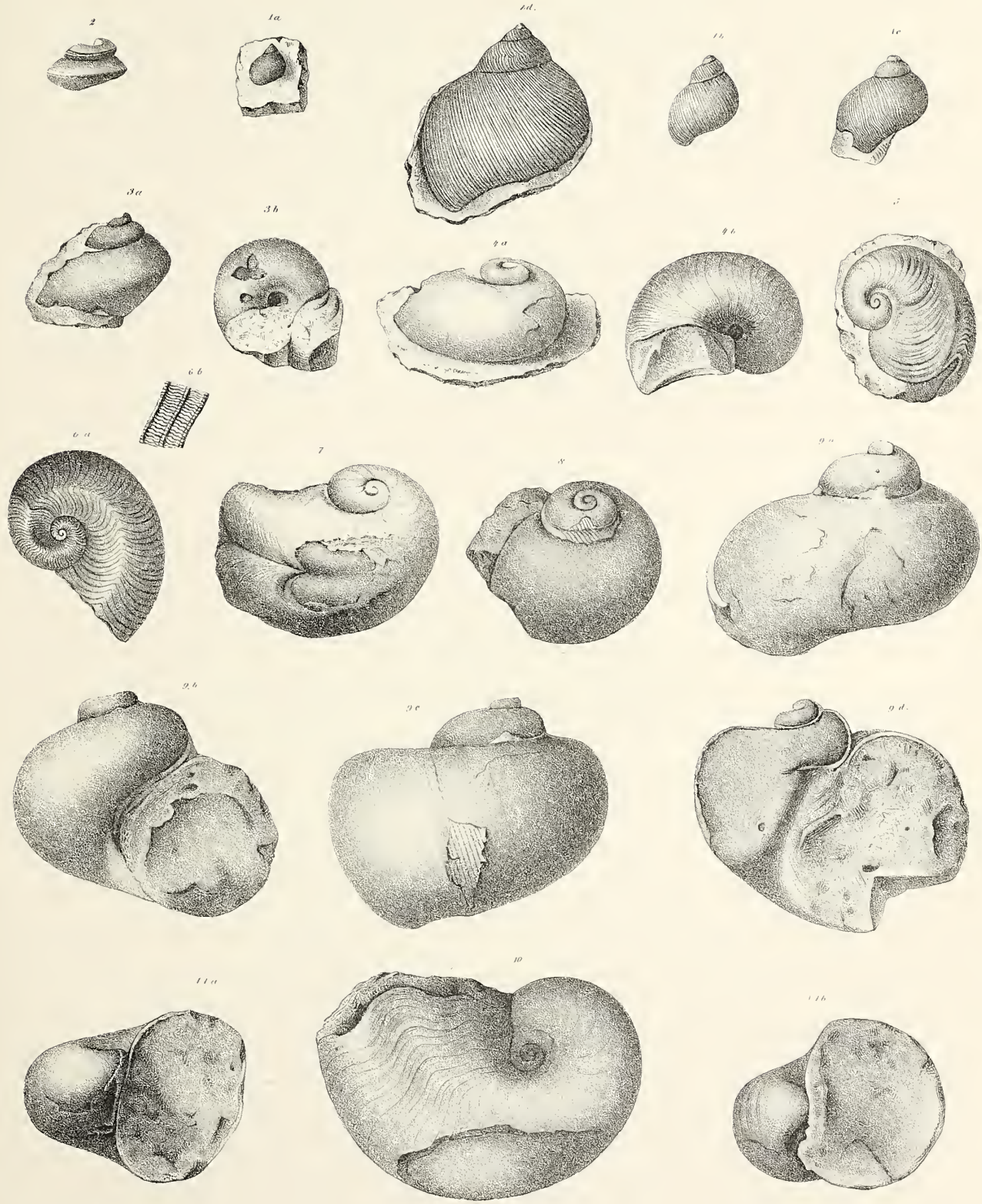
11 *b*. View of the aperture of a similar specimen.

# LOWER HELDERBERG GROUP

Del Shaly Limestone.

(GASTEROPODA.)






F.B Meek del.

# PLATE 56.

Page

Fig. 1 – 4 & 8. PLATYCERAS VENTRICOSUM. 311

1 *a*, *b*. Views of the upper and lower side of a young specimen which is a cast.

2 *a*. View of a specimen of medium size, looking upon the top of the spire.

2 *b*. View of the aperture of the same, showing also that the spire is not as high as the outer volution.

3 *a*. View of the spire of a larger specimen : the last volutions are obscured. The surface preserves a few obscure wrinkles.

3 *b*. Aperture of the same.

4. The specimen is a partial cast, preserving a small portion of the shell, and showing very distinctly the volutions of the spire.

8. A cast of the same species.

Fig. 5, 6, 7 & 9. PLATYCERAS GEBHARDI. 312

5 *a*. View of the spire of a specimen of ordinary size. The striæ are not sufficiently undulated in the drawing.

5 *b*. Profile of the same from the back of the shell.

6. The spire of another specimen where the last volution is more free near the aperture, and slightly carinated near the apex.

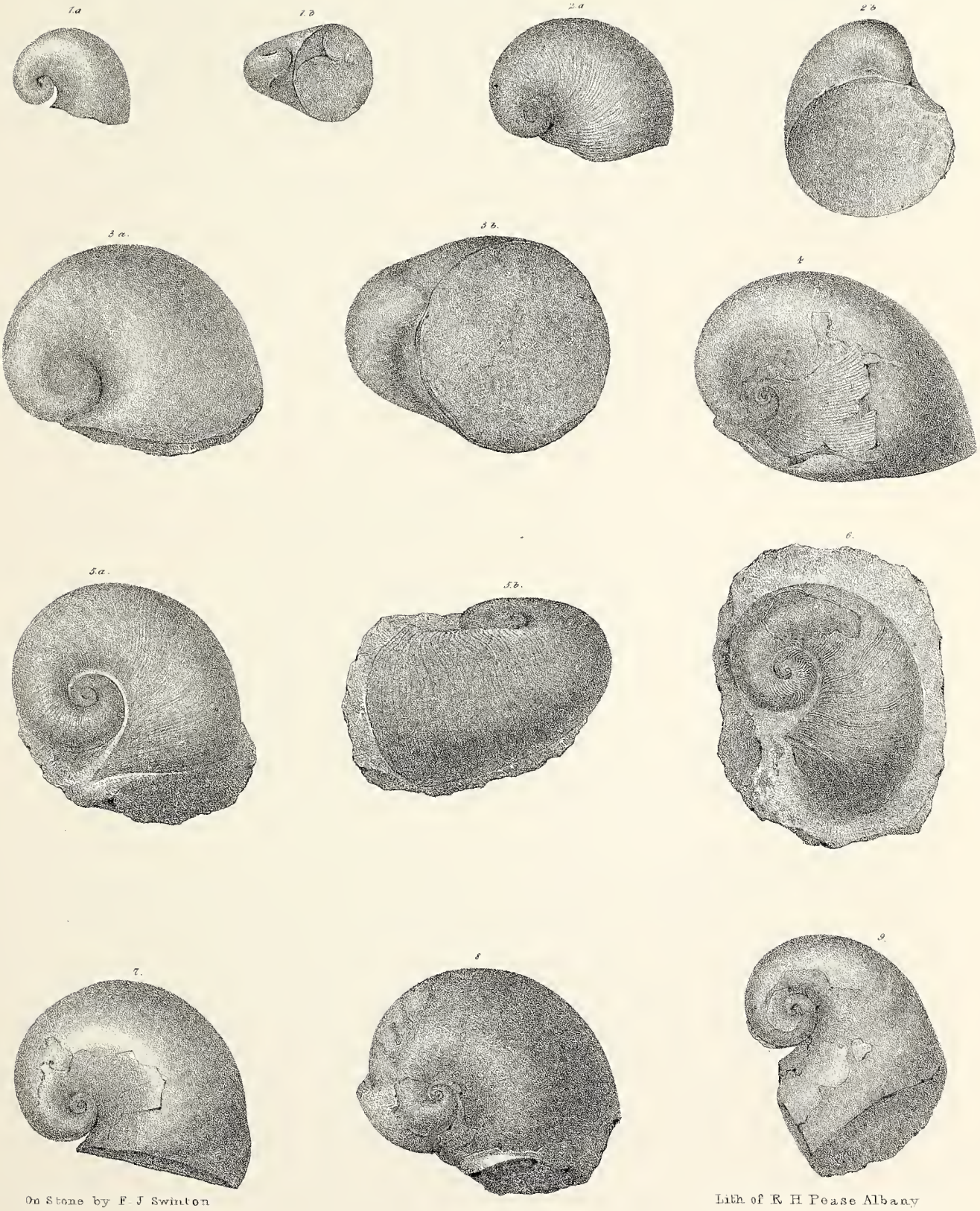
7. The cast of a specimen of this species.

9. A similar cast, the last volution becoming free.

# D. SHALY LIMESTONE.

## ( GASTEROPODA )



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# PLATE 57.

Page

Fig. 1 *a*, *b*. PLATYCERAS BILLINGSI. 315

1 *a*. View of the aperture of this species. [ The striæ on the lower side of the figure are very incorrectly represented.]

1 *b*. View looking upon the spire of the same specimen, the upper part of which shows the subangular form and the sinuosity of the striæ.

Fig. 1 *c*. STROPHOSTYLUS? ROTUNDATUS. 307

1 *c*. View of the spire, with the aperture downwards.

Fig. 2. PLATYCERAS SINUATUM. 314

2. View of the spire of a specimen of this species.

Fig. 3. PLATYOSTOMA ARENOSA. 302

3 *a*. View looking upon the spire.

3 *b*. View of the aperture of the same.

Fig. 4. PLATYCERAS VENTRICOSUM. 311

4. A large individual which is extremely ventricose. The specimen is silicified, and the surface striæ are obliterated.

Fig. 5. PLATYCERAS TRILOBATUM. 316

5 *a*. View of the aperture and part of the spire of a large individual. [ The striæ represented between the aperture and the next volution do not exist in the specimen.]

5 *b*. The lower or umbilical side of the same specimen, showing the sinus on that side.

5 *c*. The upper side of the specimen, showing the sinuosity on that side and the extension of the shell in the middle. The upper volutions are imperfect.

Fig. 6. PLEUROTOMARIA LABROSA. 339

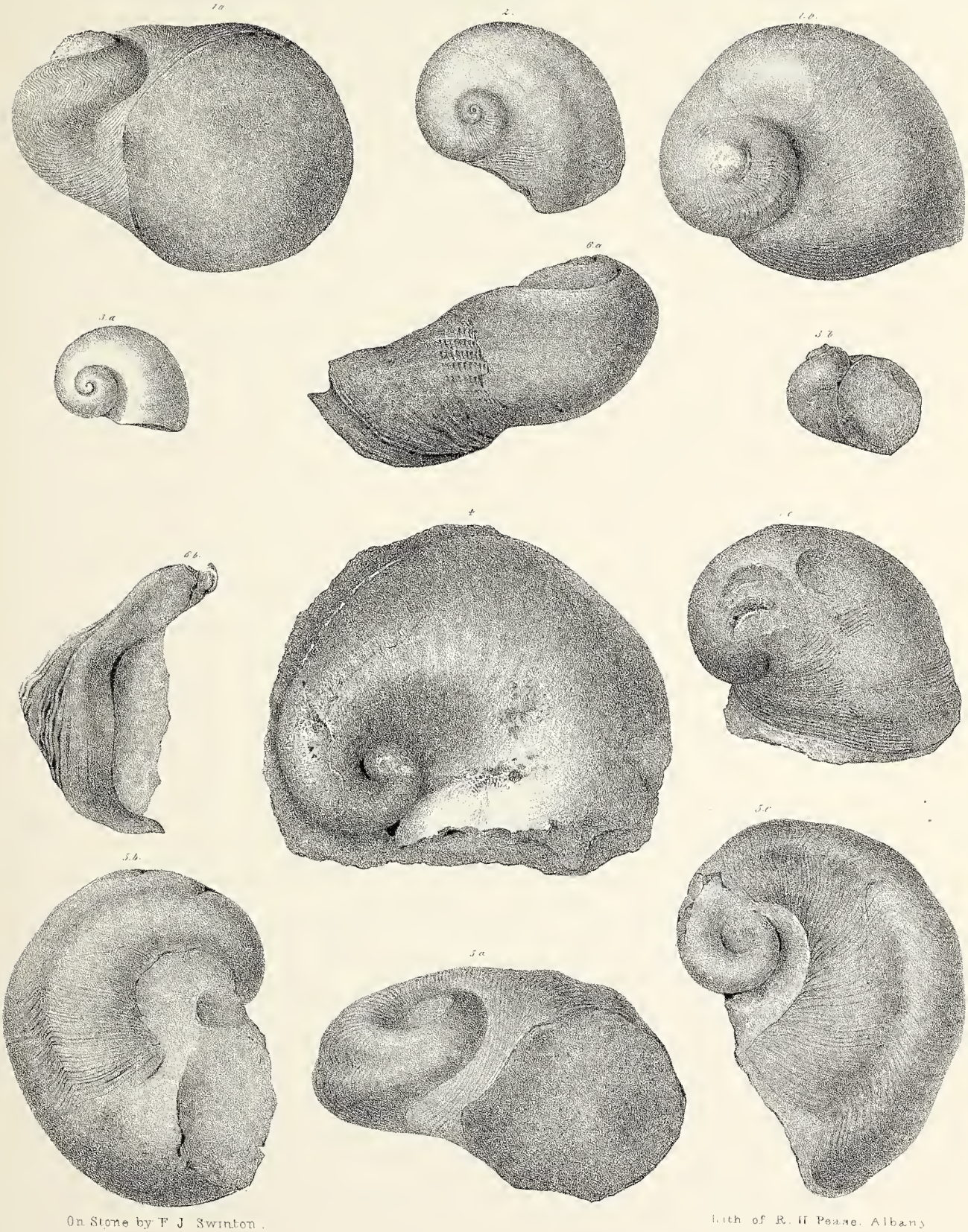
6 *a*. Profile view, looking upon the back of the specimen.

6 *b*. View of the lower side of the aperture, the upper side being broken away.

# D. SHALY LIMESTONE.

(GASTEROPODA.)



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# PLATE 58.

Page

Fig. 1 – 5. PLATYCERAS TENUILIRATUM. 317

1. A young shell where the second sinus is not developed.

2 *a*. A specimen where the second sinus has begun to be developed.

2 *b*. View of the aperture and umbilicus of the same. The expanded peristome is broken off, except a small portion adjacent to the volution.

3 *a*. Profile of a specimen which is more coarsely striated than usual.

3 *b*. Spire of the same.

3 *c*. Enlargement of the surface of this specimen, showing the transverse and longitudinal striæ.

4 *a*. View of the spire of an individual where the peristome has been much expanded on the side of the volutions.

4 *b*. Lower side of the same, showing the umbilicus. The peristome has originally extended much farther, so as nearly to cover the umbilicus.

5 *a*. A large individual of this species, showing the broad shallow sinus in the peristome.

5 *b*. View of the same, showing the sinus on the lower side of the shell.

5 *c*. An enlargement of the surface near the aperture, where the transverse striæ have become lamellose.

Fig. 6. PLATYCERAS BISINUATUM. 318

6 *a*. The upper side of the spire, showing the sinus in the peristome, and the sinus bordering the dorsal lobe : the extension of the latter, being broken off, presents the appearance of the notch in the peristome at this point.

6 *b*. The lower side, showing the sinus on the lower side of the dorsal lobe. The notch in the peristome is exaggerated by the broken condition of the shell.

Fig. 7. PLATYCERAS PENTALOBUS. 319

7 *a*. View of the spire and the plications of the surface.

7 *b*. View of the aperture and lower part of the spire.

7 *c*. Profile or dorsal view.

Fig. 8 & 9. PLATYCERAS MULTISINUATUM. 319

8 *a*. View of the aperture and lower side of the shell (which is represented as too smooth in the figure, from a little adhering stone).

8 *b*. View of the spire and upper side of the volutions, showing the folds or carina.

8 *c*. An oblique view, showing the sinuosity in the anterior margin of the aperture.

9 *a*. An older specimen in which the inequalities from the upper part of the last volution are worn off, the plications being more strongly marked on the peristome.

9 *b*. Dorsal or profile view, showing the outer volution above the apex of the spire. The deep sinus in the anterior margin of the younger shell is not conspicuous in this one, the peristome having become strongly and almost regularly plicate, except on the posterior side, where there is a broad shallow sinus.

Fig. 10. PLATYCERAS RETRORSUM. 320

10 *a*. The upper side of the spire, from which the shell is worn smooth and partially removed.

10 *b*. Profile view, showing the dorsal side and the elevated apex of the spire.

10 *c*. An imperfect specimen, which may be the young of the same.

Fig. 11. PLATYCERAS INTERMEDIUM. 321

11. View of the upper side of the spire, which is incorrectly represented at the apex. The apparent contraction toward the anterior side of the aperture is due to accident.

Fig. 12. PLATYCERAS —— sp.?

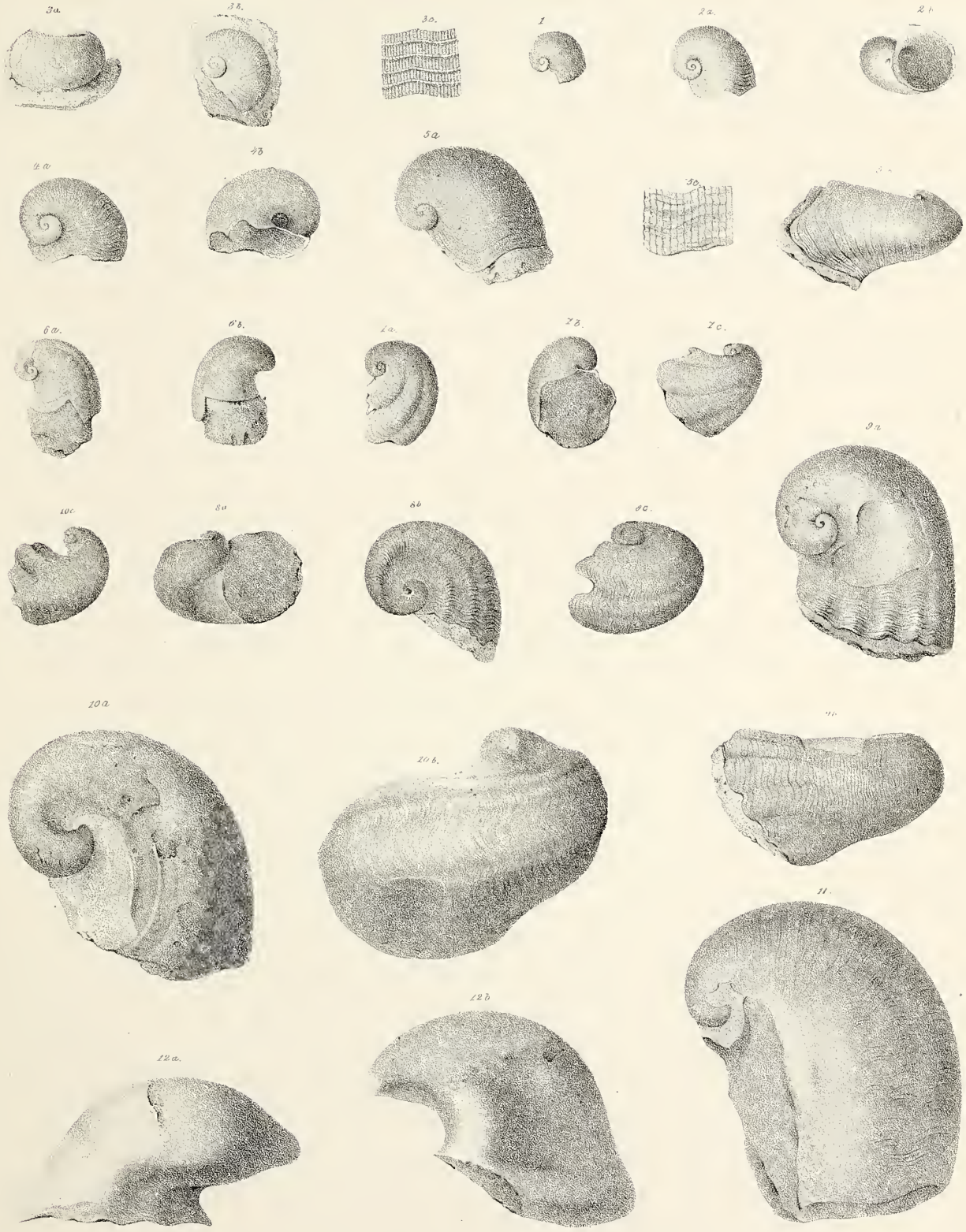
12 *a*, *b*. Two views of a cast : species undetermined.

# LOWER HELDERBERG GROUP.

( Shaly Limestone.)

(GASTEROPODA)



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# PLATE 59.

Page

Fig. 1 – 4. PLATYCERAS UNGUIFORME. 322

1 *a*, *b*, & 2. Views of young individuals of this species.

3 *a*. Profile view from the dorsal side, showing the spire and the broad flat plications.

3 *b*. View of the upper side of another specimen, with more numerous plications.

4 *a*, var. *multicarinatum*. View of the lower side of a specimen which has numerous narrow plications.

4 *b*, *c*. Views of the upper sides of similar specimens.

Fig. 5 *a* – *i* & 6 *c*. PLATYCERAS DILATATUM. 322

5 *a*, *b*. Young specimens of this species.

5 *c*. A larger specimen, showing a shallow sinus on the back and the commencement of small plications on the right side.

5 *d*. A larger specimen where the plications are more fully developed.

5 *e*. Dorsal view of a similar specimen in which the plications are more developed, and the obtuse carina extending from the apex is more defined, and ending in a broad extension in front (which is broken off in the specimen figured ).

5 *f*. View of the aperture of the same specimen, showing the incipient plications upon the left side of the aperture.

5 g. A specimen in which the spiral carina is more strongly developed, and is marked by a deep sinuosity in the peristome.

5 *h*. An enlargement of the surface, showing the bending of the striæ as they cross the carina.

5 *i*. An enlargement of the surface of a young specimen, where the longitudinal striæ are more conspicuous.

6 *c*. This specimen is probably one of the same species, which is less expanded towards the aperture, and has one more volution at the apex than the preceding figures.

Fig. 6 *a*, *b*. PLATYCERAS TENUILIRATUM. 317

6 *a*, *b*. The specimen may be a compressed form of this species.

Fig. 6 *d* – *g*, & 7 *a*. PLATYCERAS GIBBOSUM. 323

6 *d*. View of the aperture of a large specimen of this species.

6 *e*. A similar specimen, with less strongly plicated margins and a smaller spire.

6 *f*. The upper side of the spire of fig. 6 *e*. The specimen is not quite symmetrical in its convexity.

6 *g*. The upper side of the spire of the specimen fig. 6 *d*.

7 *a*. The lower side of a smaller specimen, showing strong plications.

Fig. 7 *b*. PLATYCERAS SULCOPLICATUM. 324

7 *b*. The figure represents the specimen lying with the aperture downward.

Fig. 8. PLATYCERAS PERPLICATUM. 325

8. Anterior view of the specimen.

Fig. 9. PLATYCERAS RETRORSUM. 320

9 *a*, *b*. A specimen which is probably of this species : it is broken at the apex, and somewhat otherwise distorted.

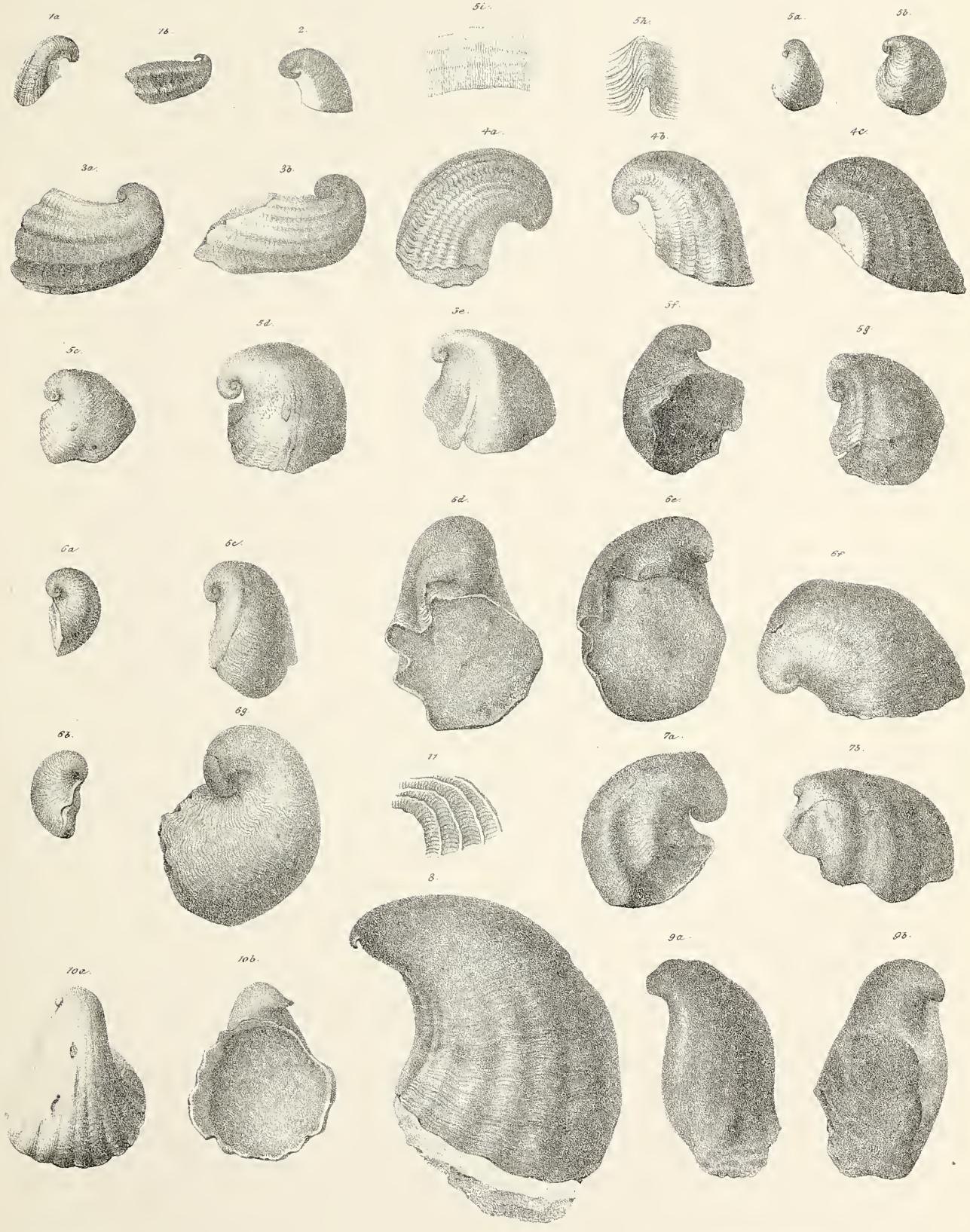
Fig. 10. PLATYCERAS PLICATILE. 325

10 *a*. View of the upper side of the shell.

10 *b*. View of the aperture.

Shaly Limestone

GASTEROPODA.

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# PLATE 60.

Page

Fig. 1 & 2. PLATYCERAS PLATYSTOMUM. 326

1 *a*. View of the right side of a specimen, the apex of which is broken off.

1 *b*. The cast of a similar specimen, preserving the impressions of the plications.

2. A similar specimen, showing a little irregularity at the apex. The plications are shown only on one side.

Fig. 3. PLATYCERAS PLATYSTOMUM, *var.* ALVEATUM. 326

3 *a*. The right side, showing the upper side of the spire.

3 *b*. The left posterior side.

3 *c*. View of the aperture.

Fig. 4. PLATYCERAS RETRORSUM, *var.* ABNORMIS. 321

4 *a*. Upper side of the shell, showing the plications and the strong lamellose striæ.

4 *b*. The lower side of the same, which is marked only by concentric lamellose striæ.

4 *c*. An enlargement of the striæ on the upper side.

Fig. 6 *a* – *c*. PLATYCERAS GIBBOSUM.

6 *a*, *b*. Two views of a much crushed specimen of this species.

6 *c*. Enlargement of the surface, showing the wrinkled transvere striæ.

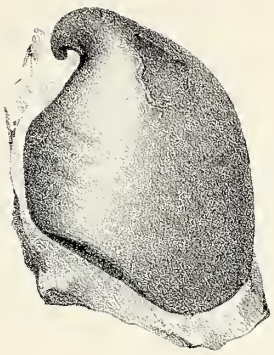
Fig. 6 *d*, *e*. PLATYCERAS BISULCATUM. 327

6 *d*. View of the upper side of the spire, showing the two sharp grooves and the broad lobes.

6 *e*. The left side, showing the sinuous striæ with an undefined longitudinal plication : there are, besides this, one or two obscure plications.

1a.

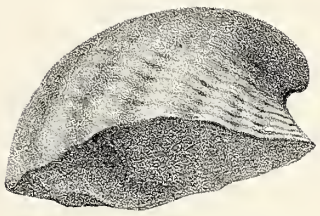
2.



1b.

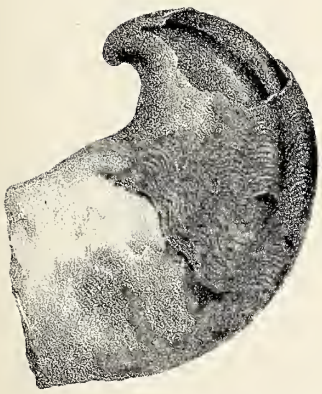
3a

3b



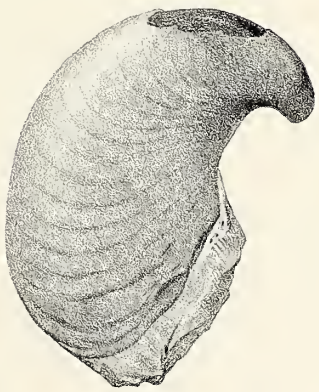
3c

4a



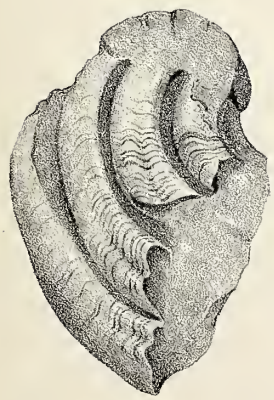
4c.

4b.

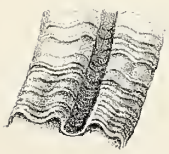


5

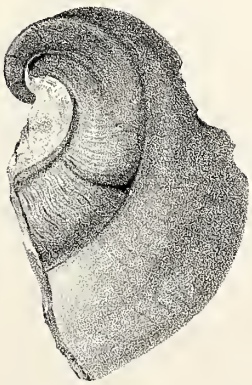
6a



6c



6b.



6d

6e

# PLATE 61.

Page

Fig. 1. PLATYCERAS PLATYSTOMUM. 326

1 *a*. The left posterior side of a specimen, which is crushed on the upper side.

1 *b*. The anterior side of the same, the distortion being due to pressure.

1 *c*. A young individual which is somewhat distorted by pressure.

Fig. 2. PLATYCERAS VENTRICOSUS.

2. View of the aperture of a specimen of this species. A part of the preceding volution has been removed by weathering.

Fig. 3. PLATYCERAS PILEIFORME. 327

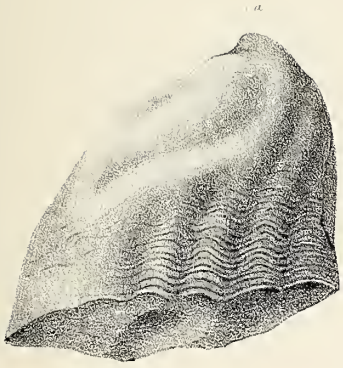
3 *a*. The upper side of a specimen in which the apex is partially broken off. [ The minute volution is seen on the specimen, though not represented in the figure.]

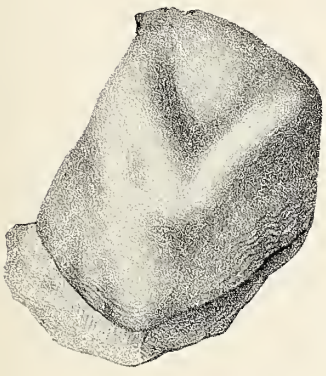
3 *b*. Profile view of a young specimen.

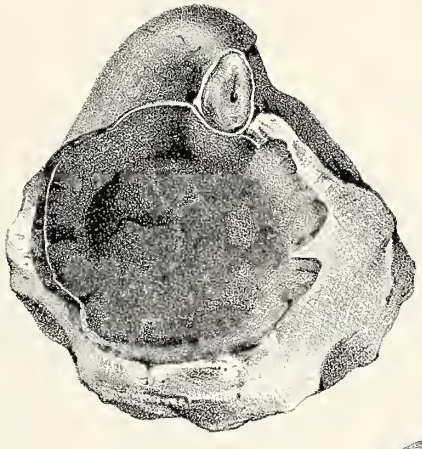
Fig. 4. PLATYCERAS PERLATUM. 328

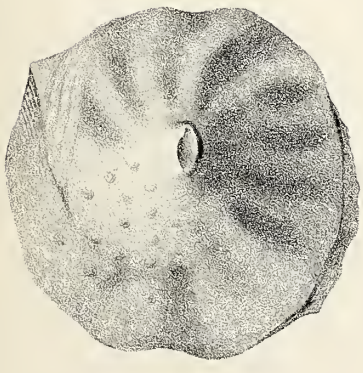
4 *a*. View looking upon the summit of the fossil. The indentation near the summit may have been due to the involution of the apex of the shell, which afterwards became solid, as the apex of the cast is not broken.

4 *b*. An oblique postero-lateral view of the specimen.









# PLATE 62.

Page

Fig. 1 – 5. PLATYCERAS CALANTICA. 328

1. View of the upper side of the spire of a specimen where the apex is entire. The shell is nearly all exfoliated from the body of the specimen.
2. A similar but less symmetrical specimen, preserving little of the shell.
3. Anterior view of fig. 1.
4. View of the upper side of the spire of a smaller specimen, in which the apex is broken off.
5. A smaller specimen of, apparently, the same species, having the apex broken off and the shell compressed from above.

Fig. 6 & 7. PLATYCERAS OBESUM. 329

6. Lateral view of the specimen, from which the shell is nearly all exfoliated.
7. A portion of the peristome, from which the upper part of the shell has been worn away, showing the plications.

Fig. 8 & 9. EDRIOCRINUS SACCULUS? 143

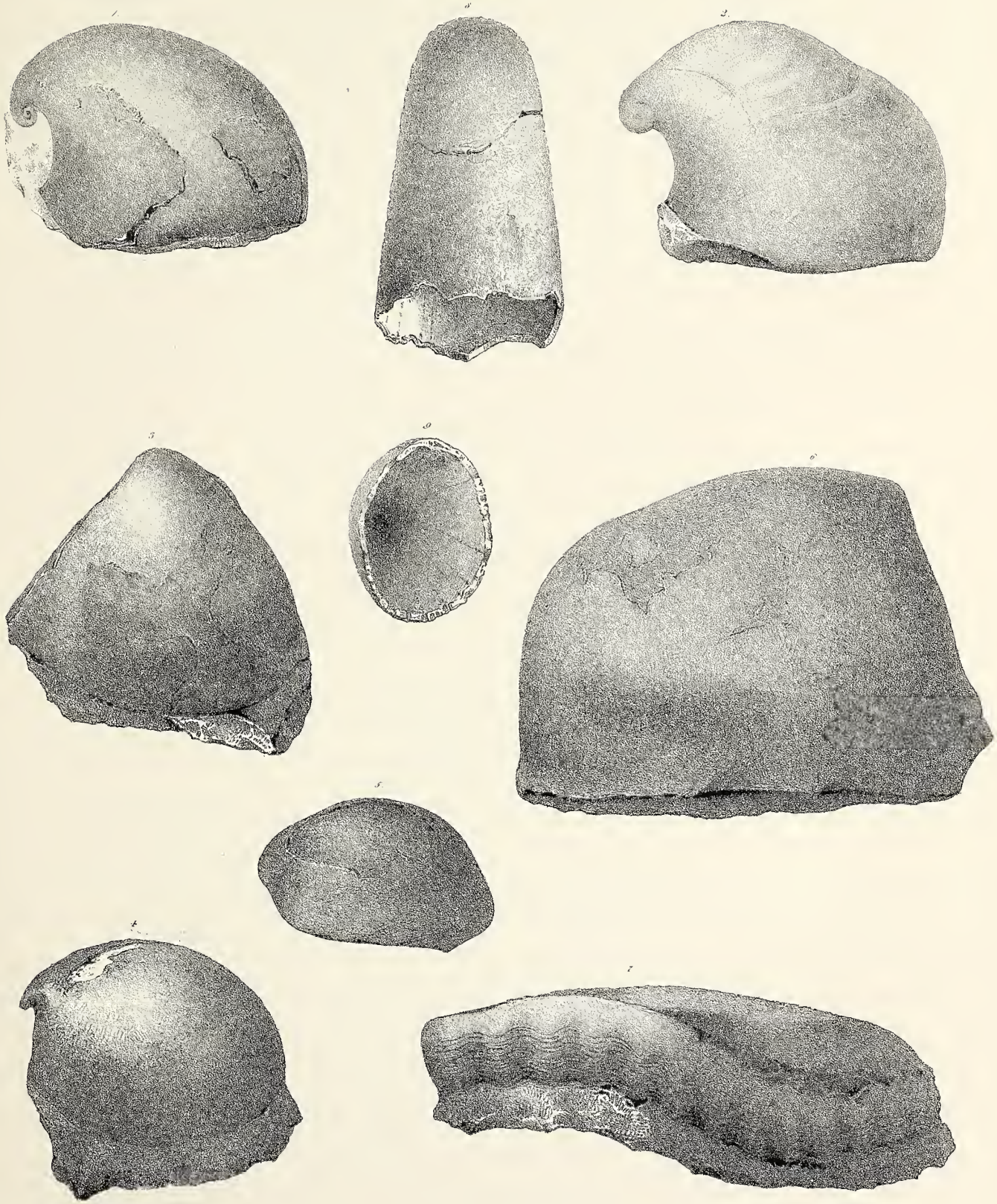
8. Lateral view of an extremely elongate specimen.
9. View showing the interior.

These same figures are given on Plate LXXXVII, fig. 19 & 20.

# D. SHALY LIMESTONE.

(GASTEROPODA.)





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# PLATE 63.

Page

Fig. 1, 2, 3. PLATYCERAS LAMELLOSUM. 330

1 *a*, *b*. The anterior and posterior sides of a small specimen.

1 *c*. Enlargement of the surface, showing the undulating transverse lamellæ and the fine longitudinal striæ.

2 *a*, *b*. Views of the anterior and posterior sides of a larger individual.

3. A larger individual, in which the transverse lamellæ are much subdued ; the longitudinal ridge is an accidental feature.

Fig. 4 – 9. PLATYCERAS SPIRALE. 331

4. A young individual of this species, in which no plications are developed.

5 *a*. A larger specimen, in which the plications are very strongly developed on the right posterior side of the shell.

5 *b*. The posterior side of the same shell.

6. A specimen of equal size with the preceding, in which the plications are but partially developed, or shown principally in the undulations of the striæ of the surface.

7. A similar specimen which is smooth on the anterior side, and showing only two or three plications on the posterior side.

8. A more elongated specimen, with strongly developed plications. ( The upper part has been broken off, and presents some imperfection at the junction of the two parts.)

9 *a*. The anterior side of another specimen, in which plications are but faintly developed.

9 *b*. The posterior side of the same. The expansion towards the aperture is increased beyond the natural width, by compression.

Fig. 10, 12 & 13. PLATYCERAS INCILE. 332

10. The lower part of the shell, consisting of a single volution.

12. A specimen preserving imperfectly the apex and nearly two volutions below. The specimen is somewhat flattened from pressure.

13. A fragment which is probably the apex of a specimen of this species.

Fig. 11. PLATYCERAS TUBÆFORME. 332

11. A fragment preserving a little more than one volution.

Fig. 14 *a* – *e*. PLATYCERAS NEWBERRYI. 333

14 *a*. Dorsal side of the last volution.

14 *b*. View of the top of the spire.

14 *c*. The lower side of the shell.

14 *d*. Posterior view, partially showing the aperture.

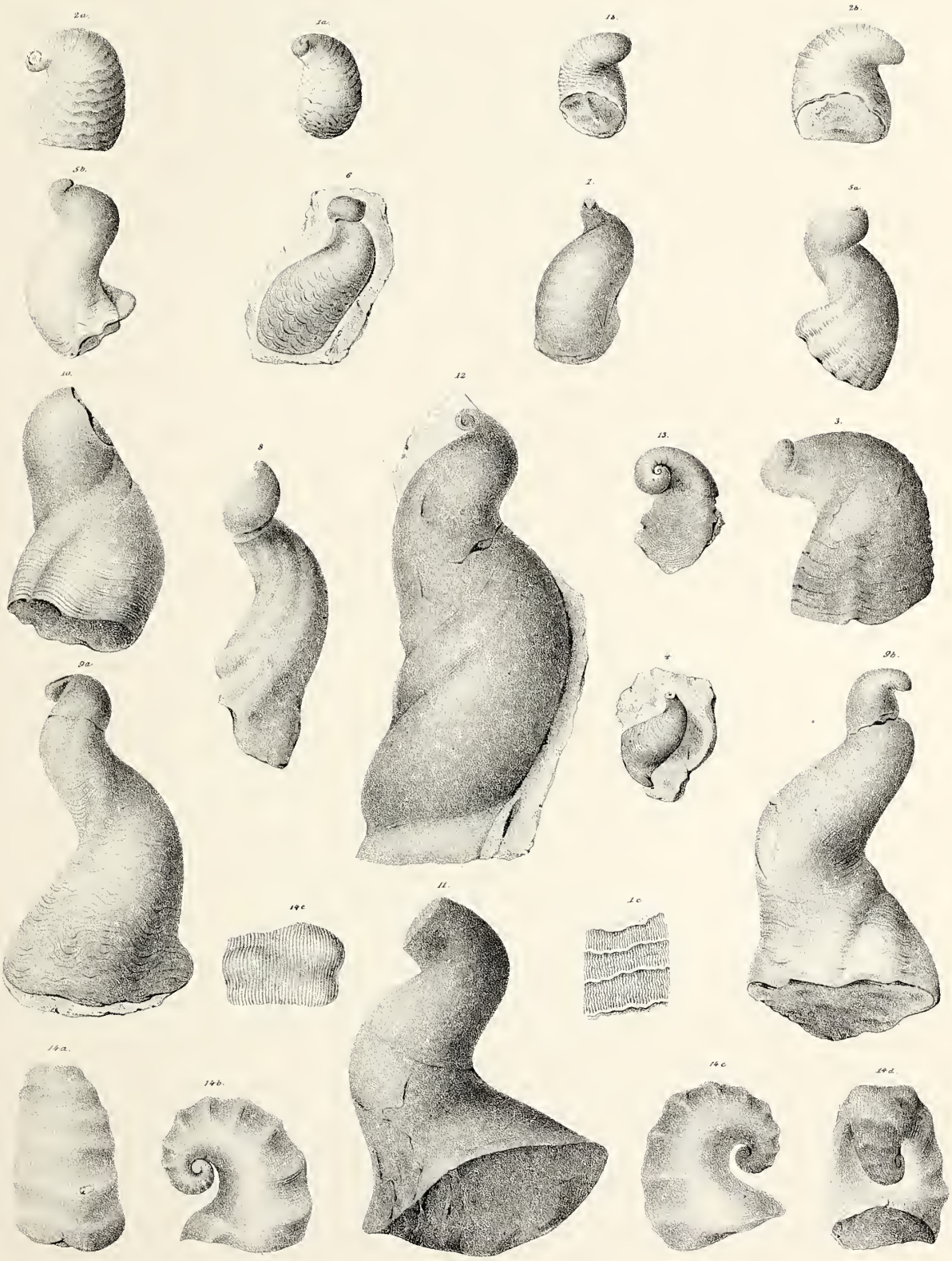
14 *e*. Enlargement of the surface, showing the longitudinal striæ.

# LOWER HELDERBERG GROUP.

(Shaly Limestone.)

(GASTEROPODA)






Swinton, del. et lith.

# PLATE 64.

Page

Fig. 1 – 5. PLATYCERAS PLICATUM. 334

1. A young specimen in which no plications are developed.
2. A more slender specimen in which the plications are strongly marked.
3 & 4. A larger individual, in which the plications are but moderately developed.
5. A large specimen which is compressed, the view showing a width greater than the natural width of the shell.

Fig. 6 & 10. PLATYCERAS ELONGATUM. 335

6. A young specimen of this species.
10. A large individual from which the extremity of the apex is broken, and the shell partially exfoliated from the lower part.

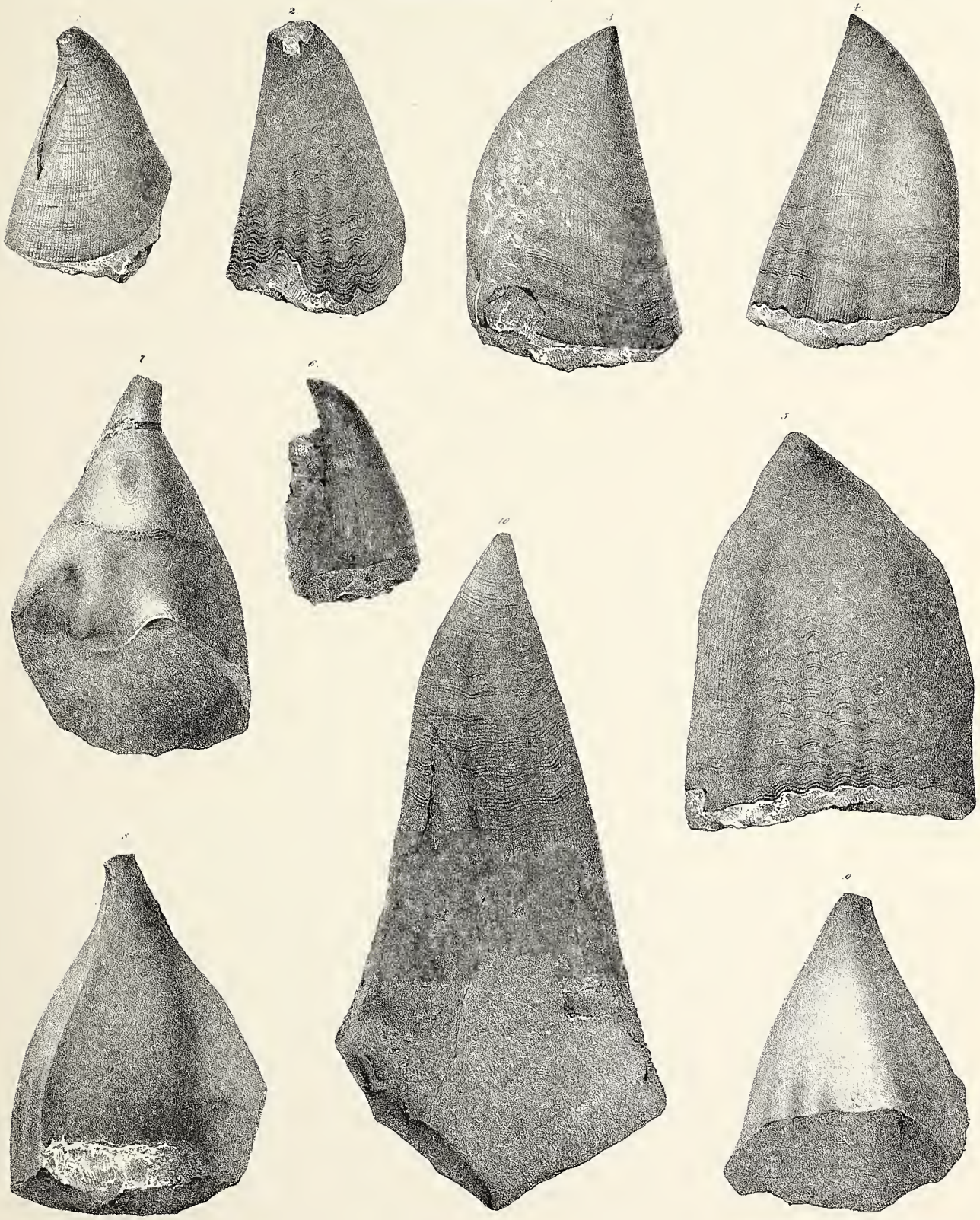
Fig. 7, 8, 9. PLATYCERAS PYRAMIDATUM. 336

7 & 8. Two views of the same specimen.
9. View of a smaller specimen.

# D. SHALY LIMESTONE.



(GASTEROPODA.)



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# PLATE 65.

Page

Fig. 1. PLATYCERAS UNDULOSTRIATUM. 336

1 *a*. View of the upper side of the spire.

1 *b*. The lower side, showing the narrow groove in the last volution.

Fig. 2. PLATYCERAS CLAVATUM. 337

2. A specimen of this species, from which the shell is nearly exfoliated.

Fig. 3. PLATYCERAS CURVIROSTRUM. 338

3 *a*. The upper side of the spire, from which the surface is nearly all exfoliated.

3 *b*. The posterior side, showing the form of the aperture.

Fig. 4 & 7. PLATYCERAS AGRESTE. 338

7. The lower side of the specimen, showing the aperture.

4. A specimen having a similar form of the body-volution, but with the apex more acute. The shell on the upper part of the volution is marked by abruptly undulating longitudinal striæ, and, near the base, the surface becomes roughly cancellated by the two sets of striæ.

Fig. 5. PLATYCERAS ELONGATUM? *var.* 335

5 *a*. A fragment of a specimen, natural size.

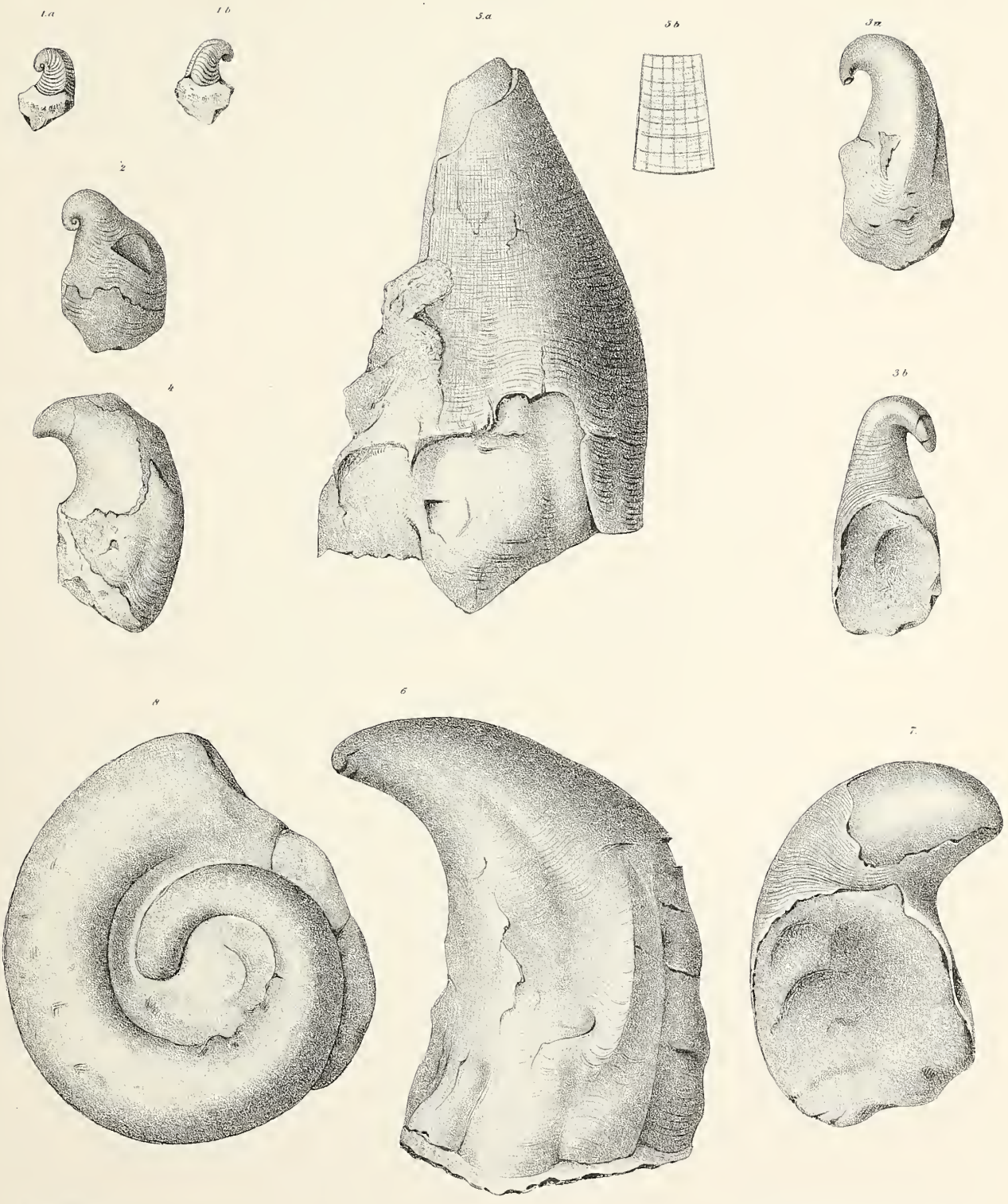
5 *b*. An enlargement of the surface striæ.

Fig. 6. PLATYCERAS ARCUATUM. 336

6. Lateral view of the specimen, natural size.

Fig. 8. EUOMPHALUS DISJUNCTUS. 340

8. The lower side of a weathered specimen of this species


1a
1b
2
3a
3b
4
5a
5b
6
7
8

# PLATE 66.

Page

Fig. 1 – 5. PLEUROTOMARIA LABROSA. 339

1 *a*. An imperfect specimen from the Shaly limestone.

1 *b*. An enlargement of the surface of the same.

2 *a*. A cast of the same species : view of the aperture, which is filled with stone.

2 *b*. View of the exterior of the specimen.

3 *a*. The exterior of a specimen where the shell is mostly removed, showing the spiral band and the sinuosity in the peristome.

3 *b*. View of the aperture of the same, showing the thickened columellar lip.

3 *c*. An enlargement of the surface markings.

4 *a*, *b*. Two views of another individual, showing in one of the figures the thickened lip, which, on the upper side, extends as far as the marginal sinus.

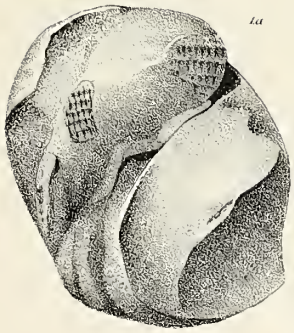
5 *a*, *b*. Two views of a crushed specimen, showing in one of the figures the externally thickened columellar lip.

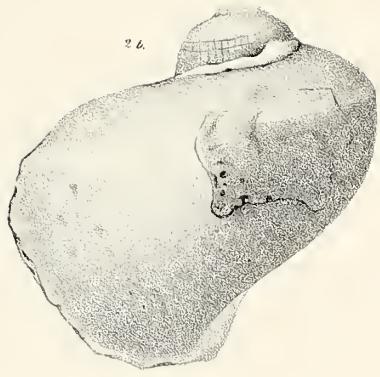
# LOWER HELDERBERG GROUP.

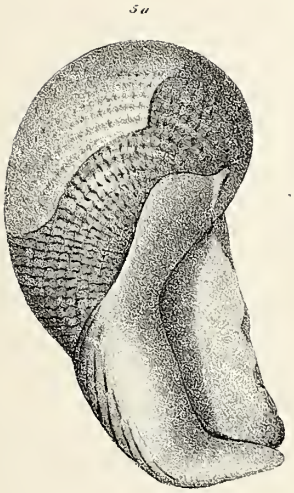


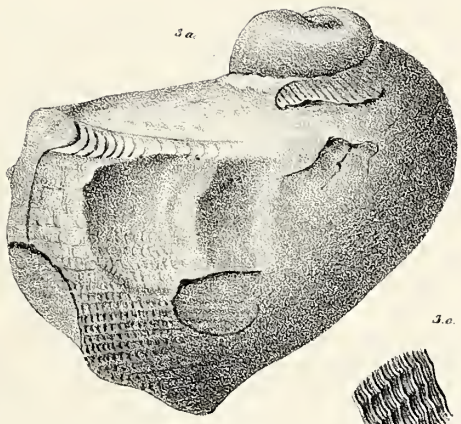
## Upper Pentamerus Limestone.

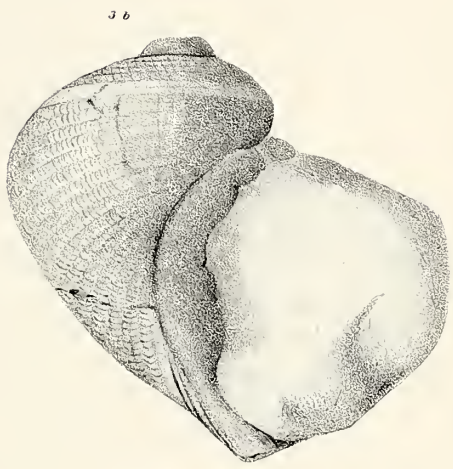
### (GASTEROPODA.)

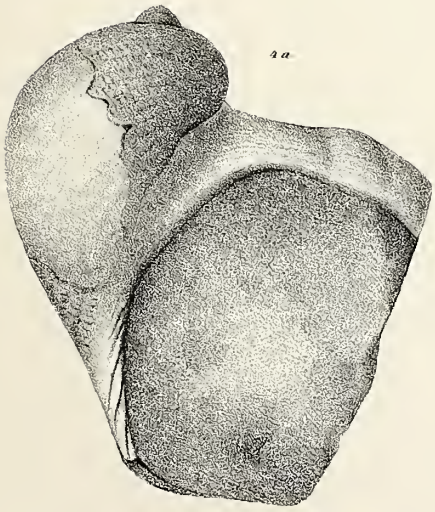


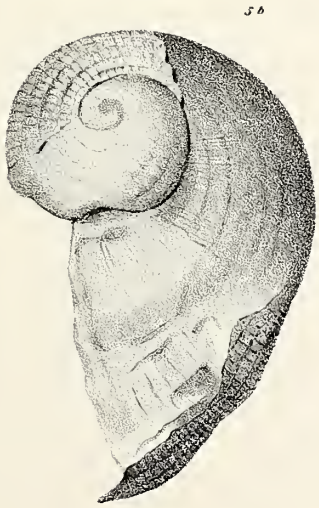


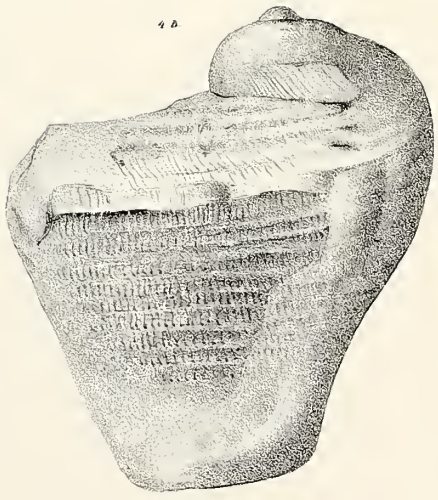






Lith. of Rich.d H. Pease Albany.

On Stone by Swinton.

# PLATE 67.

Page

Fig. 1. STROPHOSTYLUS OBTUSUS. 305

1 *a*. View showing the aperture with the obtuse spire, which is barely visible above the second volution.

1 *b*. View looking upon the spire.

Fig. 2 *a* – *e*. STROPHOSTYLUS FITCHII. 306

2 *a*. View of the aperture of a young shell.

2 *b* View of the spire of the same, which preserves but two distinct volutions.

2 *c*. View of the spire of a larger specimen.

2 *d*. A large individual in which the apex of the spire is covered by stony matter.

2 *e*. View of the aperture of the same. A careful removal of a portion of the stone from the aperture, since this figure was drawn, has shown the columellar margin, the spiral groove within, and the thickened ridge or callosity beyond.

Fig. 3. LOXONEMA ATTENUATA. 296

3. A cast of the interior, preserving eight volutions.

Fig. 4. EUOMPHALUS DISJUNCTUS. 340

4 *a*. The lower side of a cast of this species.

4 *b*. Profile view of the same.

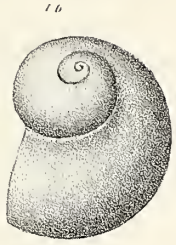
4 *c*. Transverse section at the point of fracture shown in fig. 4 *a*.

Upper Pentamerus Limestone.

(GASTEROPODA.)

2a.

1a.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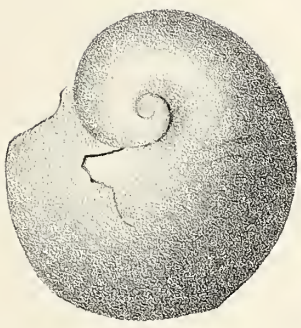
2b.

2f.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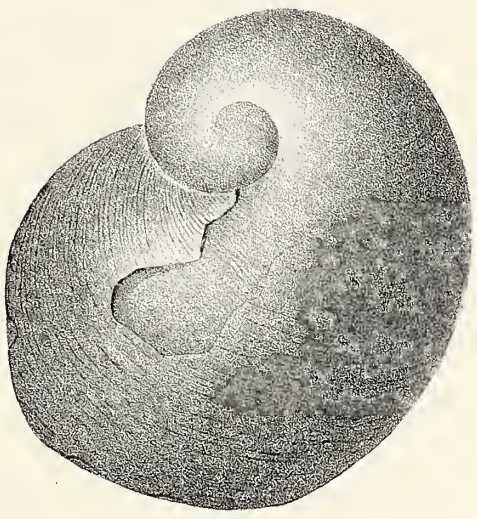
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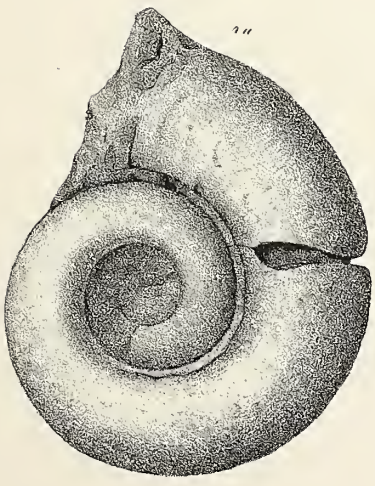
2e.

3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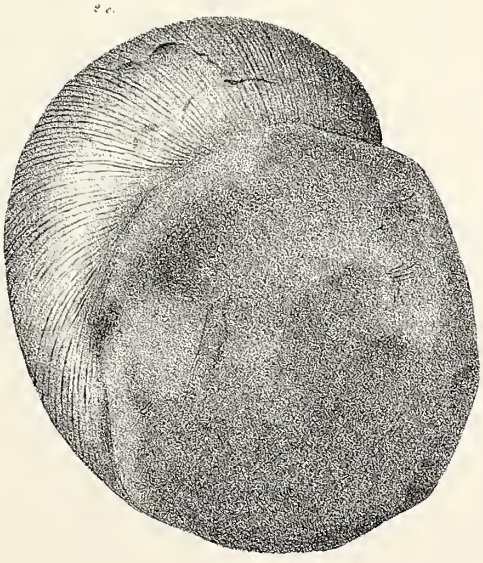
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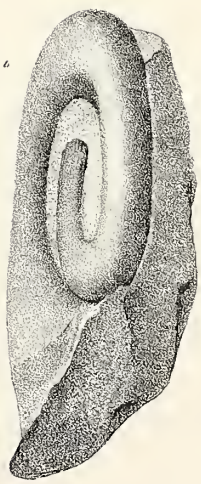
4b

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Tn Stone by Swinton

# PLATE 68.

Page

Fig. 1, 2, 3. BUCANIA PROFUNDA. 341

1 *a*. Dorsal view of a cast, in which the expanded peristome is shown upon the surface of the stone.

1 *b*. Lateral view of the same. The representation of the volutions is incorrect.

2 *a*. A small specimen in which the expanded portion is broken off.

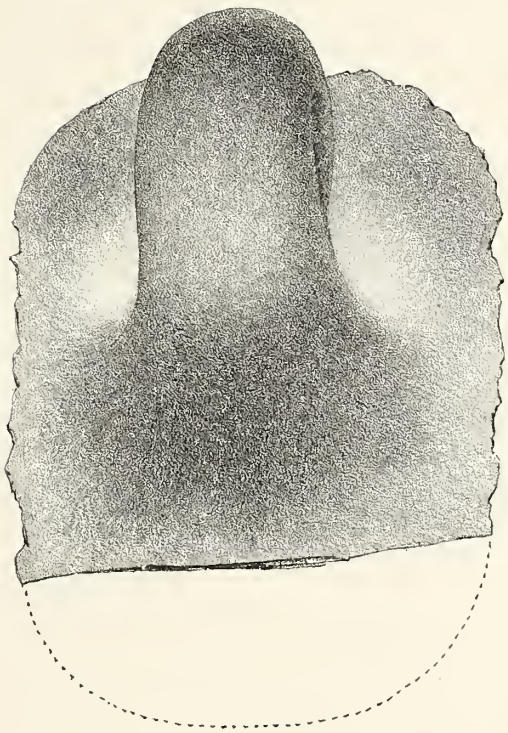
2 *b*. Lateral view of the same.

3 *a*. A specimen having a part of the outer volution broken off.

3 *b*. The umbilicus, showing three volutions.

3 *c*. Dorsal view of the same, showing an obscure carination.

1a.



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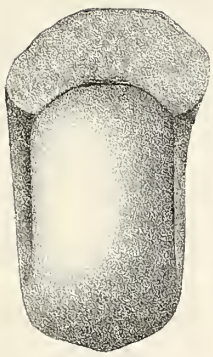
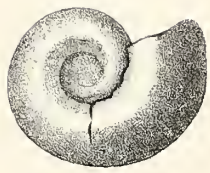


2a

2b



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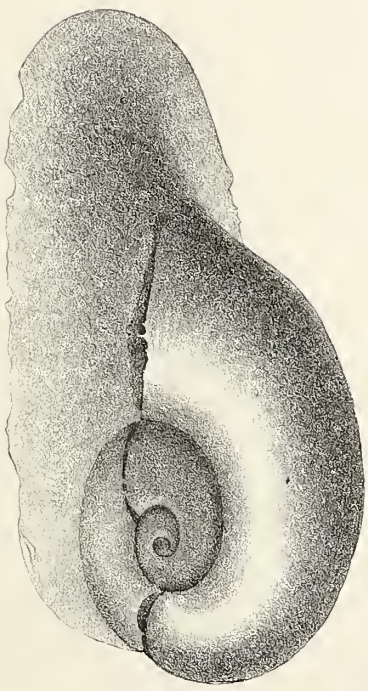

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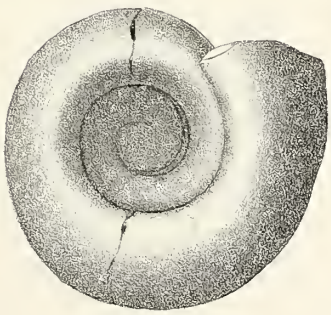

3c

F.B. Meek del.

Lith. of Fr. & H. Pease, Albany.

# PLATE 69.

Page

Fig. 1. EUOMPHALUS SINUATUS. 340

1 *a*. The lower side of an imperfect specimen, where the umbilicus is filled with stony matter.

1 *b*. The upper side of a larger specimen, the apex of which is imperfect.

Fig. 2. ONCOCERAS OVOIDES. 342

2 *a*. A longitudinal section of the specimen, showing the crowded septa near the outer chamber.

2 *b*. The exterior of the cast of the same specimen.

Fig. 3 *a* – *d*. CYRTOCERAS SUBRECTUM. 342

3 *a*. A cast preserving a part of the outer chamber and about twenty septa. The back is somewhat worn, so that the form of the siphuncle is seen.

3 *b*. Lateral view of a fragment of a larger individual, showing the cast of the interior of the siphuncle.

3 *c*. A smaller individual, lateral view. The apparent rapid attenuation above is due to compression of the lower part of the specimen.

3 *d*. A portion of the cast of the siphuncle, with the filling between the adjacent septa.

# LOWER HELDERBERG GROUP

(Tentaculite Limestone.)

(CEPHALOPODA, etc.)



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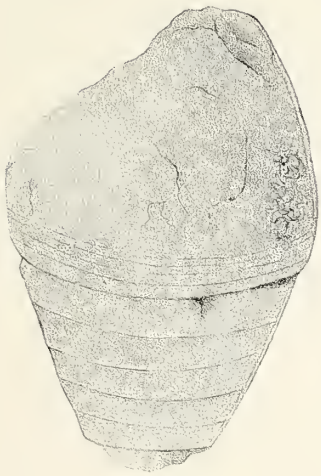
2 a



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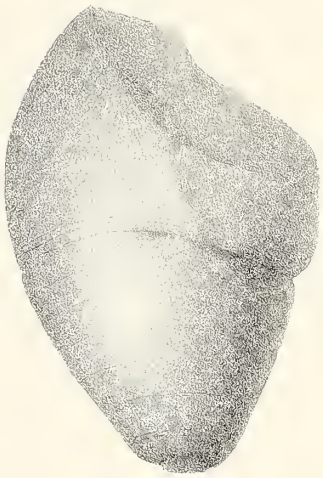
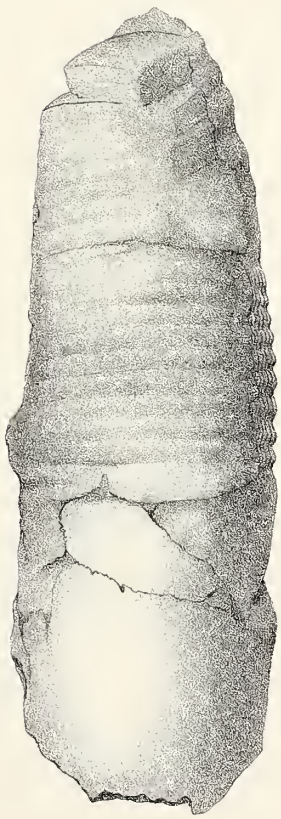


1 b.

3 d.

3 b



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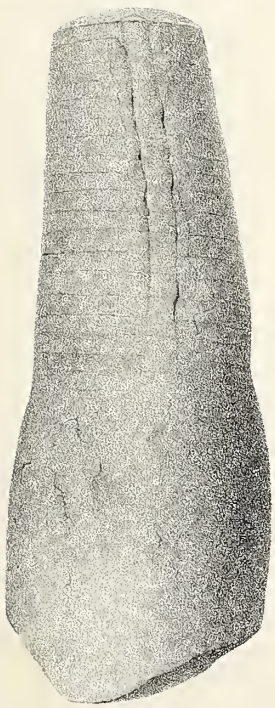

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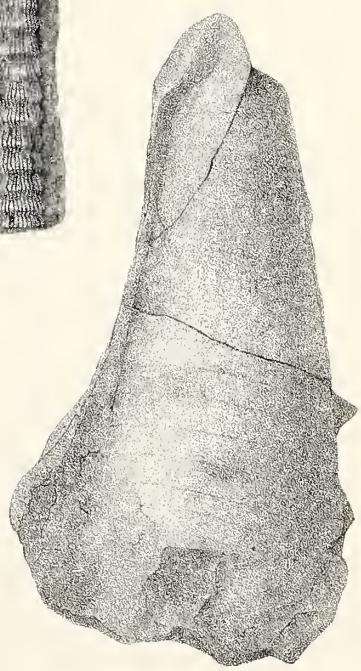



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# PLATE 70.

Page

Fig. 1. ORTHOCERAS LONGICAMERATUM. 343

1. The siphuncle has been filled with crystalline matter, and the swollen portions are concave above and beneath, indicating a thickening of the septum at its junction with the narrower parts of the siphuncle. Some remains of the septa are still perceptible.

Fig. 2. ORTHOCERAS —— (sp. undetermined).

Fig. 3 *a* – *d*. ORTHOCERAS RIGIDUM. 344

3 *a*. A fragment of this species, having the shell almost entirely removed.

3 *b*. A continuation of the same specimen.

3 *c*. Transverse section, as shown in the line of fracture of fig. 3 *b*.

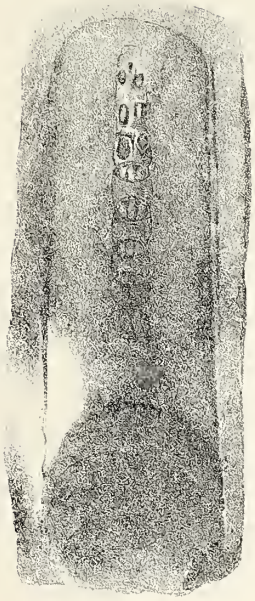
3 *d*. Enlargement of the striæ. The position of the figure represents the striæ in the reverse of their natural relation, which is horizontal.

# LOWER HELDERBERG GROUP

(Pentamerus limestone etc.)

(CEPHALOPODA.)





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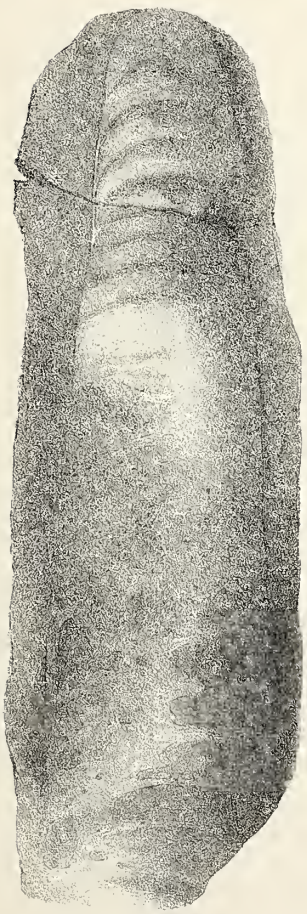

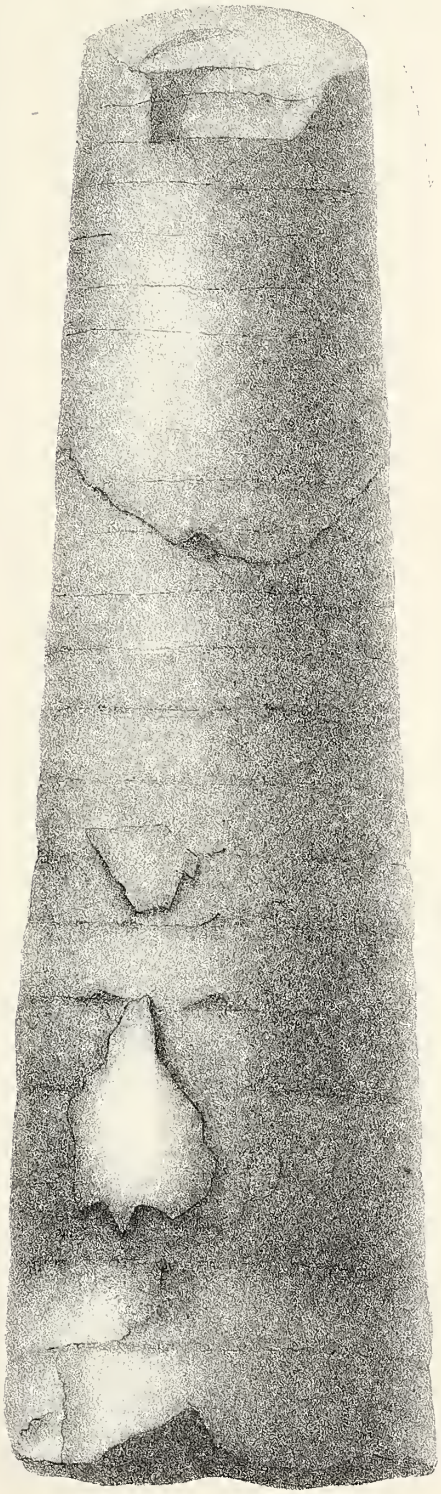

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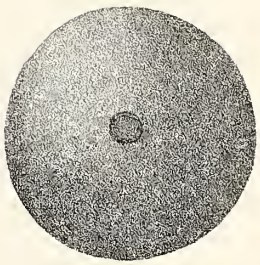
3c



3b

E.B. Meek, del.

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# PLATE 71.


Page

Fig. 1 & 5. ORTHOCERAS LONGICAMERATUM. 343

1. A fragment of a large specimen preserving a part of the outer chamber, with about fourteen of the first chambers.

5. A longitudinal section of a specimen, apparently of the same species, the septa being proportionally a little more distant.

Fig. 2. ORTHOCERAS SUBTEXTILE. 344

2. The specimen, natural size.

Fig. 3. ORTHOCERAS ——? Undetermined. 345

Fig. 4. ORTHOCERAS CLAVATUM. 345

4. A fragment, preserving a part of the outer chamber and several of the septa above.

# PENTAMERUS LIMESTONE.

(ORTHOCERATA.)

On Stone by F. J. Swinton.

Lith. of R. H. Pease, Albany

# PLATE 72.


Page

Fig. 1. ORTHOCERAS TENUIANNULATUM. 345

1. A fragment, natural size.

Fig. 2. ORTHOCERAS HELDERBERGIÆ. 345

2. A specimen of this species, showing some remains of septa.

Fig. 3. ORTHOCERAS PERSTRIATUM. 346

3. A fragment preserving a part of the outer chamber and several of the chambers above, from which the shell is partially exfoliated.

Fig. 4. ORTHOCERAS RUDIS. 346

4 *a*. The fragment, somewhat flattened from pressure.

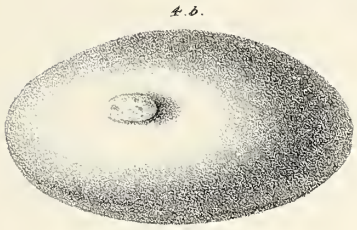
4 *b*. A section showing the subcentral position of the siphuncle.

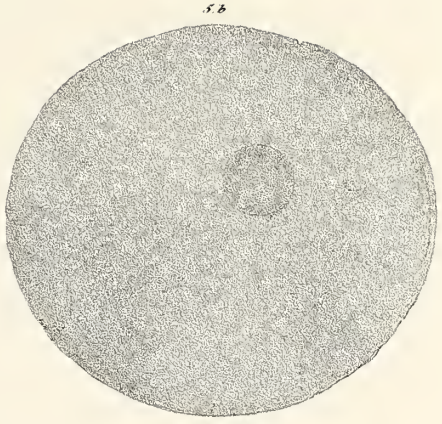
Fig. 5. ORTHOCERAS PAUCISEPTUM. 346

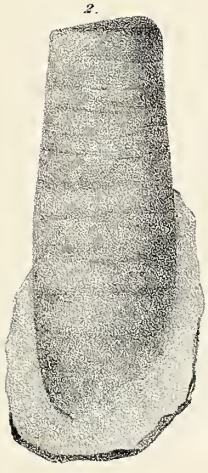
5 *a*. A fragment of this species. The lower chamber is cut longitudinally, to show the place of the siphuncle.

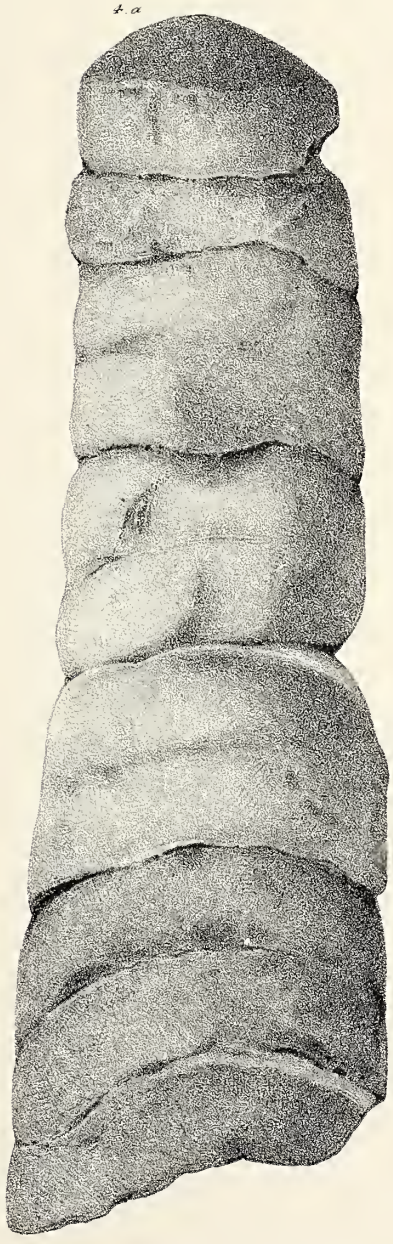
5 *b*. Transverse section, showing the excentric position of the siphuncle.

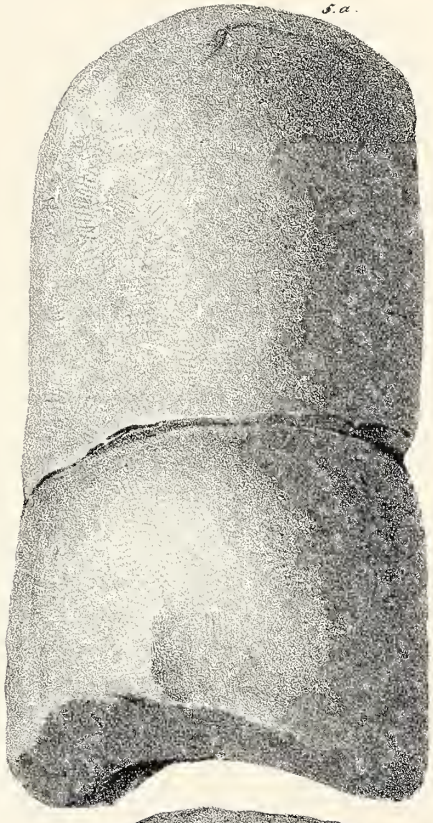
(ORTHOCERATA.)

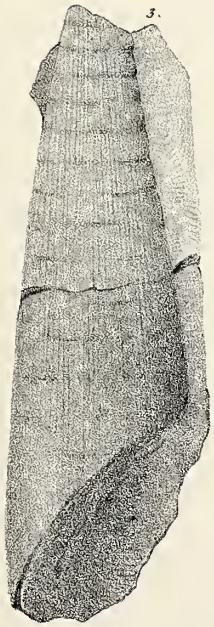


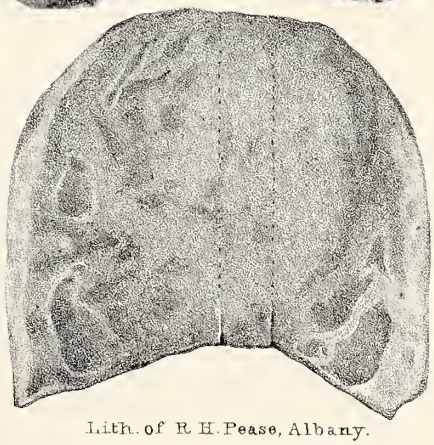



On Stone by F. J Swinton.

Lith. of R. H. Pease, Albany.

# PLATE 72 A.

*** By error, this plate is referred to in the text as Plate LXXII A.

Page

Fig. 1 *a*, *b*, *c*. CONULARIA PYRAMIDALIS. 347

1 *a*. A compressed specimen preserving a smooth convex apex. Of two similar specimens, one has an apparent perforation in the apex.

1 *b*. A broken specimen, which preserves the quadrangular form of the shell.

1 *c*. Enlargement of the surface as it usually appears under a lens.

Fig. 2 *a*, *b*. CONULARIA HUNTIANA. 348

2 *a*. Figure of a compressed specimen, from which the apex has been broken.

2 *b*. An enlargement of the surface, showing the double transverse ridge.

Fig. 3 *a*, *b*, *c*. CONULARIA LATA. 479

3 *a*, *b*. A figure from a cast made in the mould of the shell represented on Plate CXI, and the same enlarged.

3 *c*. An enlargement from a cast made in the imprint left in the stone, at one of the angles of the shell, showing an unusual lateral compression of the nodes, a feature shown in some degree upon all specimens.

Fig. 4. CONULARIA DESIDERATA (n. s.). 480

(CONULARIA —— ? Text, p. 480.)

4. A fragment near the apex, enlarged. So far as can be discovered, this species has never been marked by longitudinal ridges or nodes, the transverse ridges being smooth and continuous.

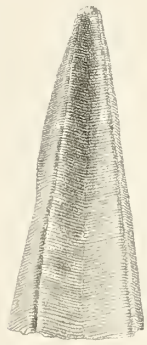
# LOWER HELDERBERG & OLIVER
# &
# ORISKANY SANDSTONE

## (PTEROPODA)



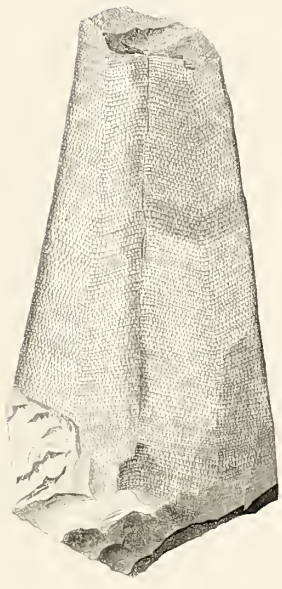
1b

1a



1c

2a



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3c

# PLATE 73.

Page

Fig. 1 – 4. BRONTEUS BARRANDI. 350

1. The pygidium of the natural size. (The specimen is imperfect, and the figure is completed from a cast of the impression in stone.)
2. The impression of the same.
3. Profile of the same.
4. Enlargement of the surface, showing the undulating striæ and minute granulations.

Fig. 5 – 7. PROETUS PROTUBERANS. 351

5. The head of this species.
6. A fragment preserving the head and part of the thorax.
6 *a*. Lateral view of the same.
7. The pygidium of another individual.
7 *a*. Profile of the same.

Fig. 9 – 13. HOMALONOTUS VANUXEMI. 352

9. A fragment of the thorax of a specimen of medium size.
10. The pygidium of a small specimen.
11. Profile view of the same.
12. The pygidium of a large individual.
13. An enlargement of the surface.

NOTE. The differences in the two specimens of the pygidium here figured induce a doubt of their specific identity; the distinctly trilobate character of the smaller specimen contrasts strongly with the larger one, in which the lobes and annulations are less distinctly marked, while the extremity has been much more extended. The smaller form may be regarded as the typical form of *H. vanuxemi;* while the larger one may perhaps prove a distinct species, or at least a strongly marked variety.

The fragment of the thorax figured is very much flattened upon the back; and though its relations are not determinable, it appears more nearly related to the smaller than to the larger pygidium. It will require better materials for the satisfactory determination of these species.

Fig. 15 – 25. PHACOPS LOGANI. 353

15. An entire specimen which has the head compressed from above, and the eyes a little distorted.
16. View of a specimen which is enrolled.
17. The head of a larger individual which shows the transverse furrows, and preserves the eyes in their proper form.
18. A larger head, which has few pustules in the space between the eye and the dorsal furrow.
19. Front view of fig. 17.
21. View of the lower side of the head of another specimen, showing some crenulations along the marginal furrow.
22. The lower side of a specimen in which the granulation is worn from the surface of the glabella, and showing the line of the hypostomal suture.
23. The eye enlarged.
24. A portion of the eye, from which the lenses have been removed by weathering.
24 *a*. An enlargement of a portion of the eye.
25. The hypostoma.

Fig. 26, 27, 28. PHACOPS HUDSONICUS. 355

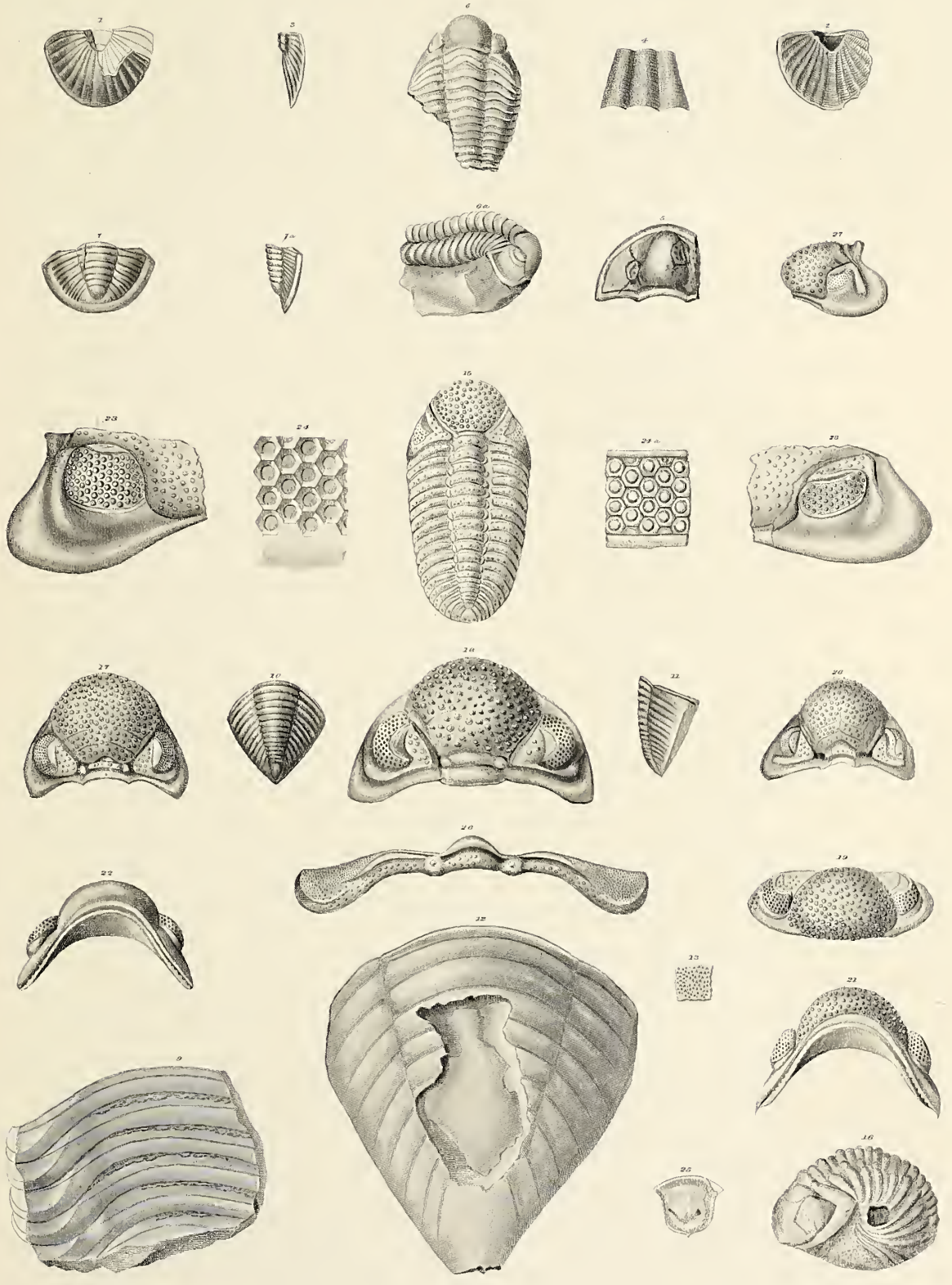
26. The head of this species. 27. Profile of the same. 28. The eye enlarged.

*Correction for description on page* 355. HEAD semielliptical: length greater than half the width; posterior angles extended and abruptly rounded. Cheeks broad triangular, produced behind.

# LOWER HELDERBERG GROUP.



(CRUSTACEA)



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# PLATE 74.

Page

Fig. 1 – 12. DALMANIA PLEUROPTYX. 356

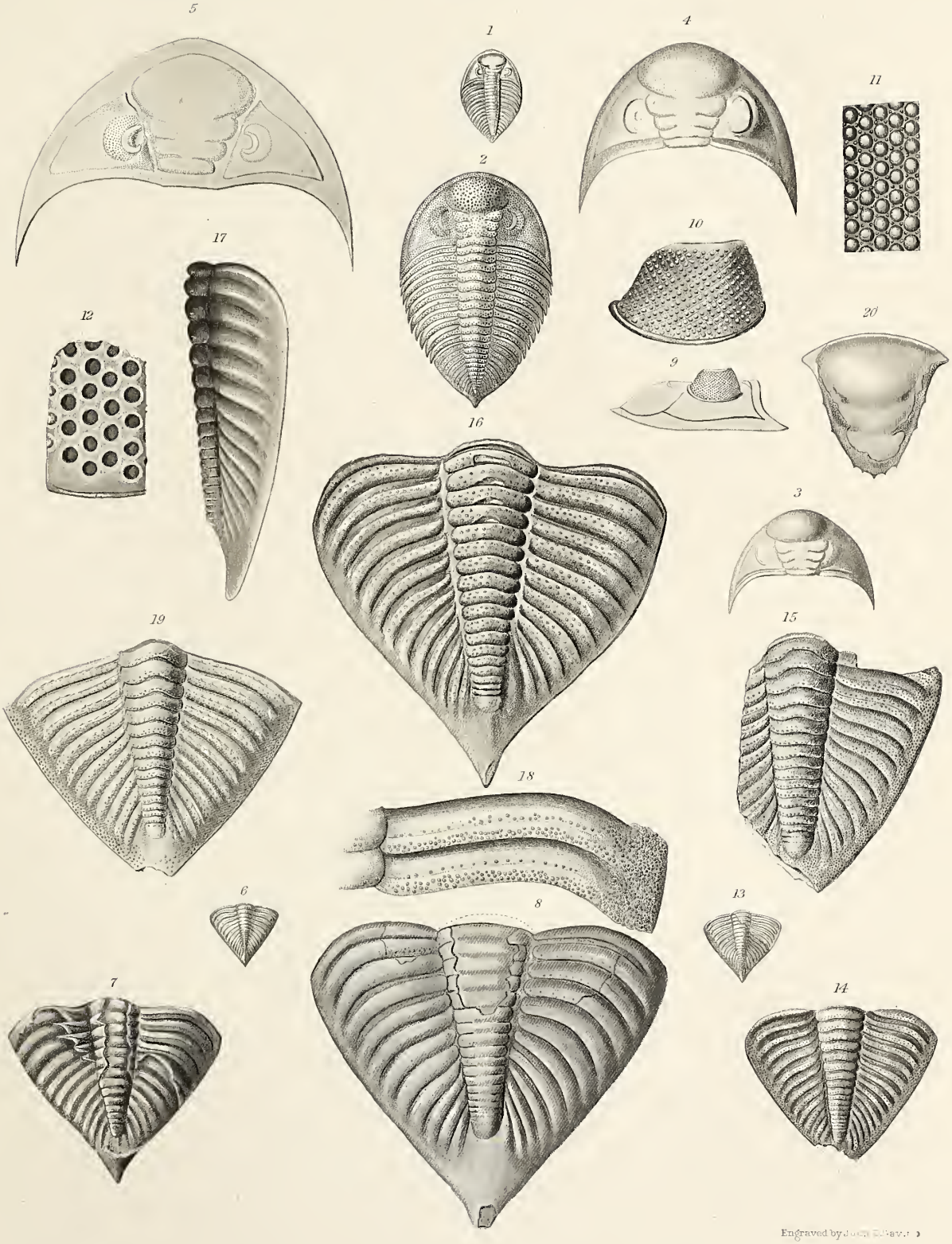
1. A young specimen which is extremely flattened.
2. The same enlarged, showing more distinctly the characteristic features of the species.
3 & 4. The head of a young and of a half-grown individual, which are probably of this species.
5. The original preserves the central portion of the head, with one eye nearly entire. The posterior angles are completed from another specimen.
6. The pygidium of a young specimen.
7. The pygidium of a larger individual.
8. A larger individual in which seventeen annulations are distinctly visible in the axis (and an eighteenth is very faintly indicated), and thirteen ribs in each lateral lobe.
9. Profile of the head, showing the form and elevation of the eye.
10. The eye enlarged.
11. A portion of the surface still farther enlarged.
12. A magnified portion of the eye, where the lenses have been removed by weathering.

Fig. 13 – 20. DALMANIA MICRURUS. 359

13. The pygidium of a young specimen, contrasting with fig. 6 in the number of annulations of the axis and ribs in the lateral lobes.
14. A small pygidium having fifteen ribs on each lateral lobe, and twenty annulations of the axis.
15. A fragment of a similar pygidium, on which the test is very perfectly preserved.
16. A larger pygidium from which the test has been removed, leaving the cast punctate.
17. Profile view of the same.
18. An enlargement to show the surface markings, from fig. 15.
19. The pygidium of a medium-sized specimen, showing some variation in form.
20. The hypostoma probably of this species. The crust has been removed from the central portion.

# LOWER HELDERBERG GROUP.

## CRUSTACEA

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# PLATE 75.

Page

Fig. 1. DALMANIA PLEUROPTYX. 356

1. The specimen is a cast preserving a part of the head, the axis and one lateral lobe of the thorax, and a part of the pygidium. From the condition of the specimen, it cannot be positively referred to this species, though there can be little doubt of its identity.

Fig. 2. DALMANIA NASUTUS. 362

2. The inner side of the crust of a pygidium, showing the thickened border and a part of the posterior spine.

Fig. 3 – 6. DALMANIA TRIDENS. 361

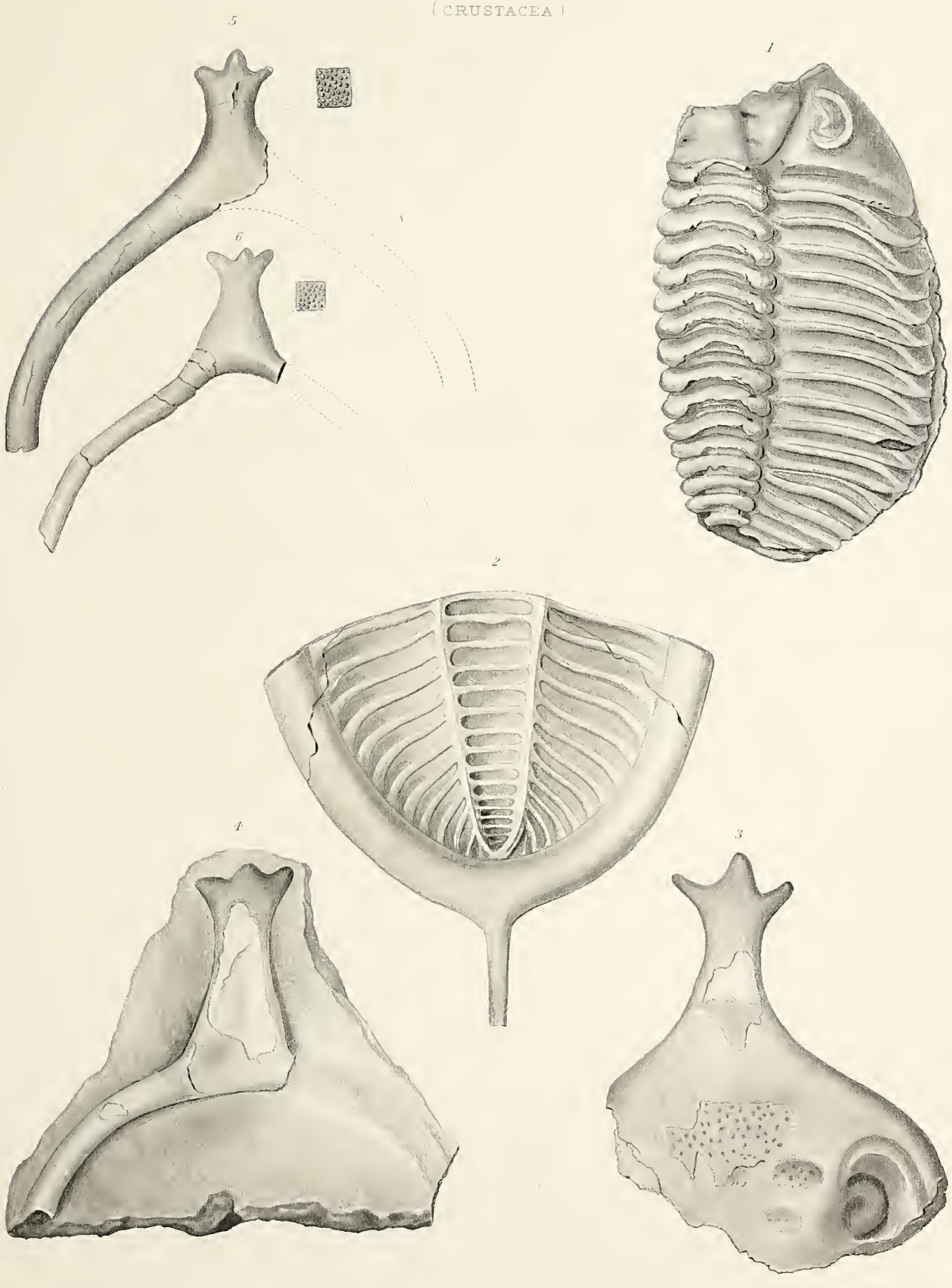
3. The underside of a portion of the head, showing the cavity of one eye and the extension of the frontal process.

4. A fragment of the lower surface, showing the marginal limb on one side and the frontal process. The abruptness of the junction of the process with the marginal limb, as represented in the figure, is due to an imperfection in the specimen at that point.

5 & 6. Fragments of the marginal limb and the frontal process from the lower side, with portions of the surface enlarged.

# LOWER HELDERBERG GROUP.

(CRUSTACEA.)




Engraved by John E. Gavit.

# PLATE 76.

Page

Fig. 1 – 8. DALMANIA NASUTUS. 362

1. The head of a specimen, natural size. The frontal process is broken off; and the continuation, as represented, is drawn from fig. 2.
2. An imperfect head preserving the glabella (which is distorted by pressure), the bases of the eyes, and the frontal process. The extremities of the bifurcation are broken off, and their true extent is not known.
3. The underside of the test of the head, preserving the anterior border and the frontal process.
4. The eye and part of the cheek, from another specimen.
5. Profile view of the same, with the posterior portion extended.
6. A portion of the eye-surface enlarged, showing the lenses and the rounded grains between.
7. The pygidium, showing the elongate caudal spine.
8. Profile view of the same.

Palæont. N.Y. V. 1

# LOWER HELDERBERG GROUP.

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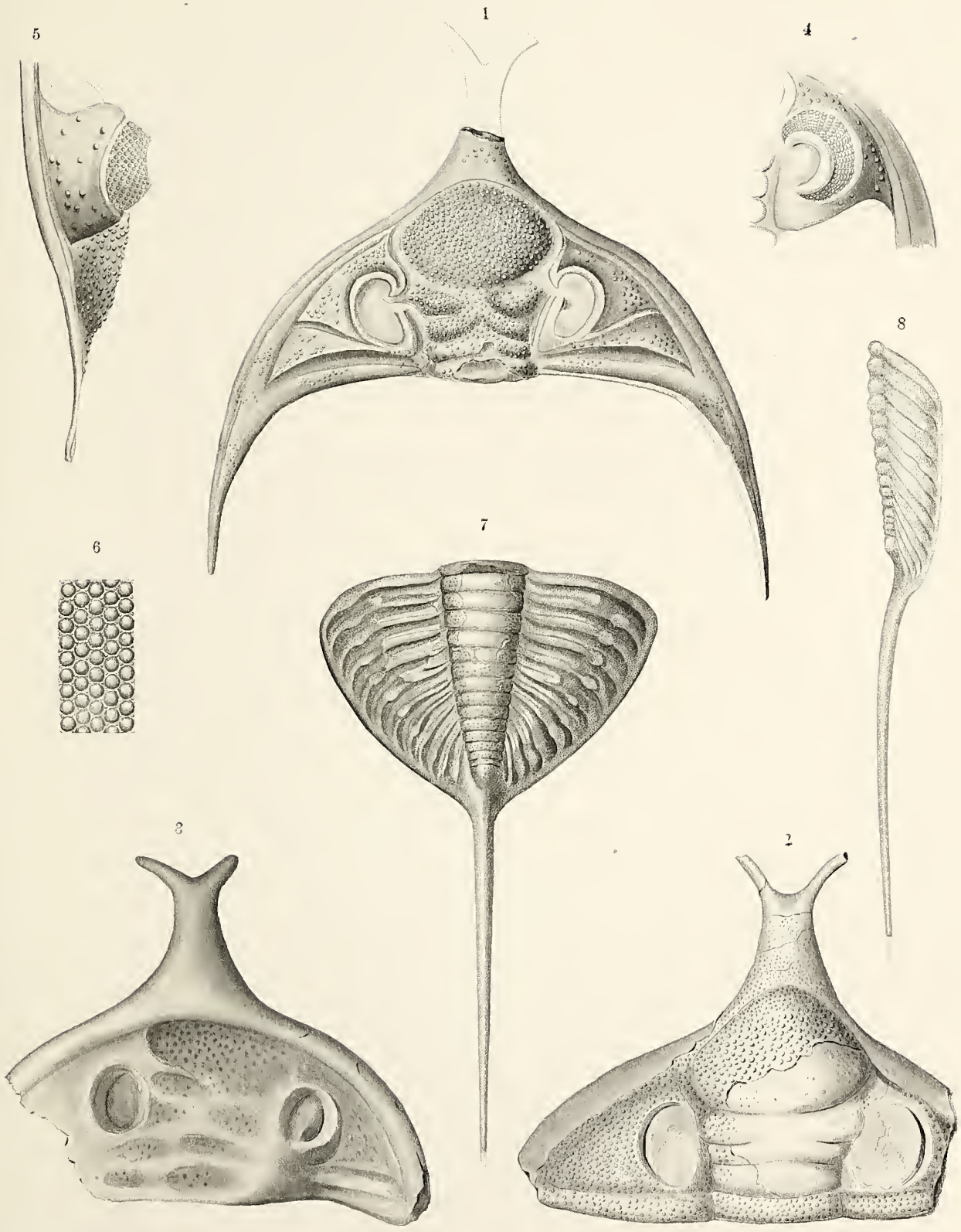


B. Meek Del.

# PLATE 77.

Page

Fig. 1 – 8. LICHAS BIGSBYI. 364

1. Profile view of an imperfect head. The median lobe of the glabella is not represented as sufficiently prominent.
2. View of the upper side.
3. Anterior view, showing the elevation of the median lobe and the frontal limb. The surface is represented as too coarsely pustulose.
4. View of the upper side of the head of another individual. The median lobe of the glabella is not sufficiently narrowed in its posterior part. The surface markings in this figure present the prevailing feature.
5. The median and anterior lateral lobes of the glabella of a larger specimen, which is somewhat depressed.
6. Profile view of the same.
7. The hypostoma.
8. A part of the pygidium of this species.

Fig. 9 – 11. LICHAS PUSTULOSUS. 366

9. A portion of the head, showing the median and anterior lateral lobes of the glabella.
10. Lateral view of the same.
11. A fragment of the pygidium, showing a part of the axis and the ribs on one side.

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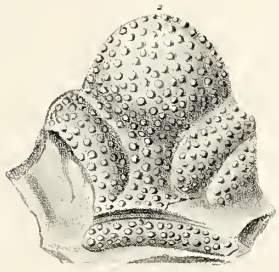

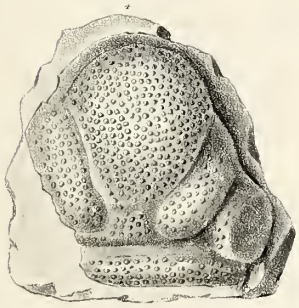
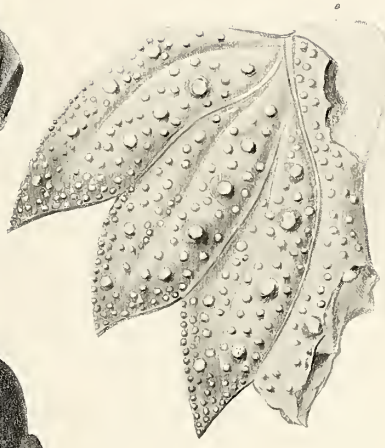
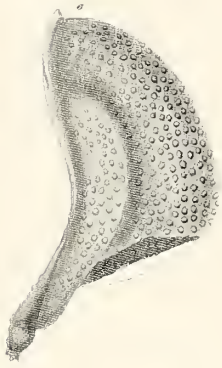
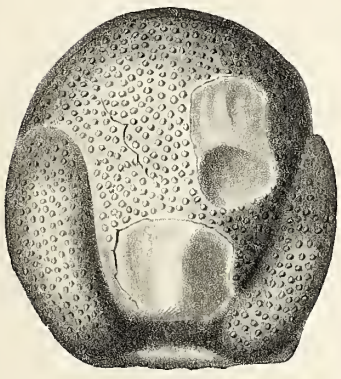
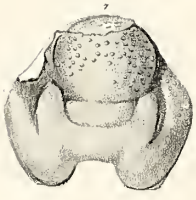

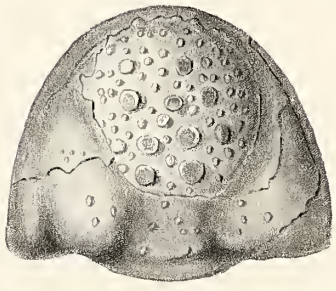

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# PLATE 78.

Page

Fig. 1 – 7. LICHAS PUSTULOSUS. 366

1. A part of the head, showing the median lobe and anterior lateral lobes of the glabella, the occipital furrow and annulation. The specimen has been crushed, and some parts of it are incorrectly represented.

2 & 3. Fragments showing the lower side of what appear to have been the movable cheeks.

4. The pygidium, which is nearly entire in all its parts, except the protuberance and the spines at the extremity of the axis, which are broken off. The short spines towards the posterior extremity are, in this specimen, a little on one side of the centre.

5. A fragment of the pygidium, where the posterior part of the axis is extremely prominent, and the bases of the principal and smaller lateral spines are preserved. The continuation of the ribs is preserved only in outline.

6. The underside of a part of the pygidium, showing the thickened border, the sharp elevations separating the ribs, and those marking the furrow upon them. The round pits indicate the bases of the large tubular spines, which ornament the surface with some regularity.

7. The lower side of a pygidium, showing the broad thickened border and the deep cavity made by the protuberance at the extremity of the axis. The bifurcations of the central lobe are more diverging than usual, but this feature is accidental in the specimen.

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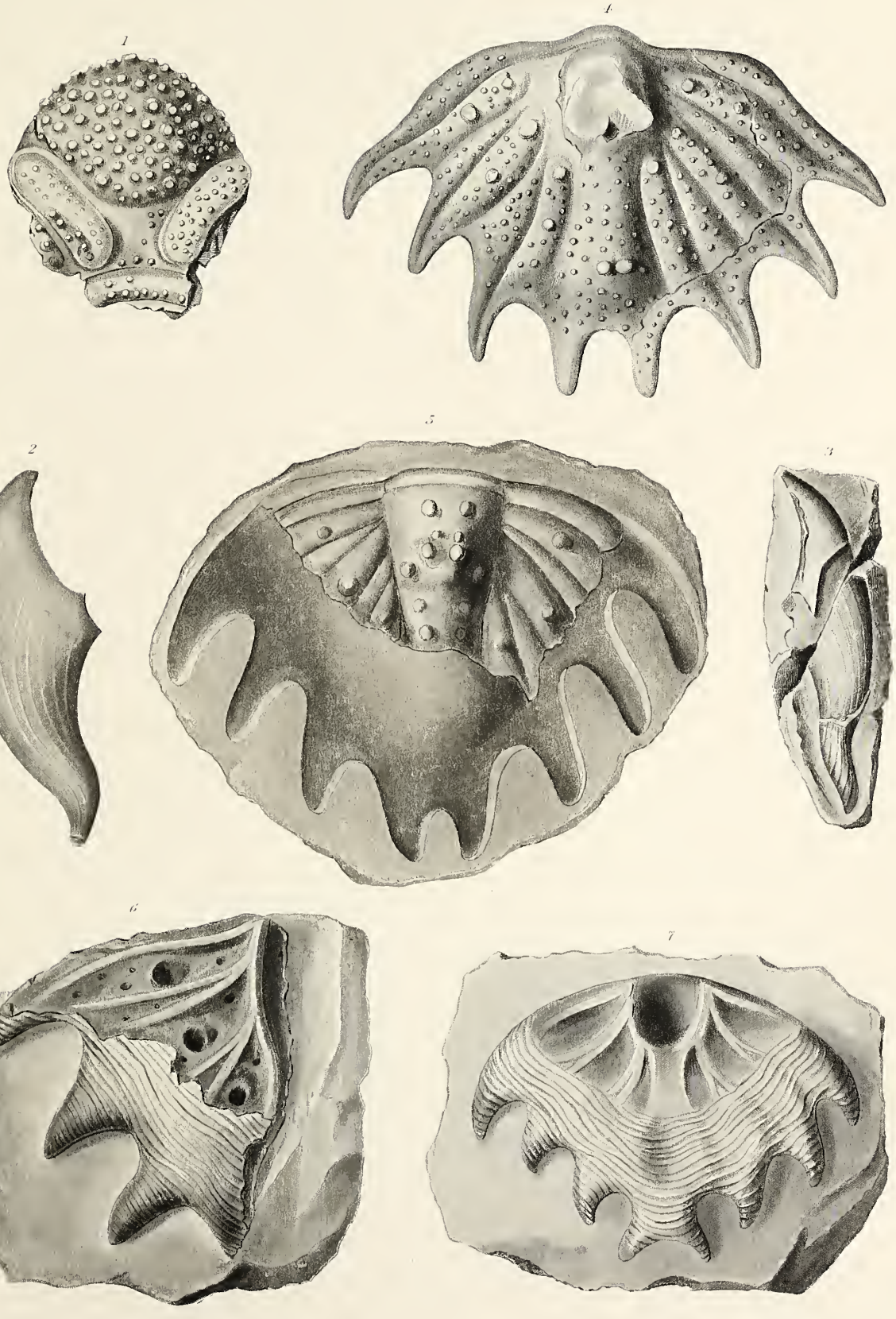


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# PLATE 79.

Page

Fig. 1 – 14. ACIDASPIS TUBERCULATUS. 368

1. View of a specimen preserving the members in connexion; but the fossil being imbedded in a hard stone, the condition does not admit of the parts being shown in detail.

1 *a*. The counterpart of fig. 1, showing the extensions of the lateral spines and the form of the pygidium.

2. The central portion of the head, showing the lobes of the glabella, the frontal border, the occipital annulation, and the central posterior spine.

3. The central part of the head of another specimen.

5. A portion of the surface enlarged.

6 & 7. The right cheeks of two different individuals, preserving the eye tubercle, and showing differences in the exterior and inner spines.

8. The left cheek, which shows very distinctly, as do the others, the gradation of the border ornaments, from small nodes at the anterior extremity, to distinct spines.

8 *a*. A cheek, with the eye tubercle, enlarged.

9 & 10. The underside of two cheeks, one of which shows a single spine on the inside, and the other a single spine with the rudiments of two others above it.

11. An articulation of the thorax.

12. The underside of a part of the thorax, showing the extension of the lateral spines of the articulations.

13. The pygidium, in which the upper lateral spine is not fully developed.

14. The pygidium of another individual, showing the parts described.

Fig. 15 – 19. ACIDASPIS HAMATA. 371

15. A small individual preserving the central portion of the head and the occipital spine.

16. A larger individual.

17. Profile view, showing the recurved spines.

18. The bifurcating occipital spine of a larger individual.

19. A fragment of the thorax, and the pygidium, probably of this species.

19 *a*. A fragment of the thorax of a large individual, showing the prolongation of the lateral lobes into spines.

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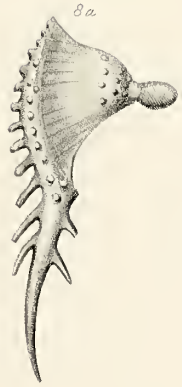
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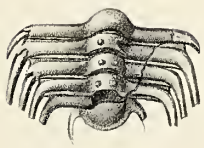
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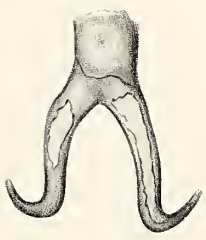
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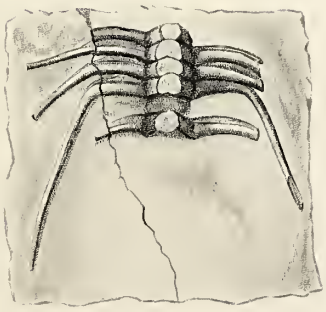
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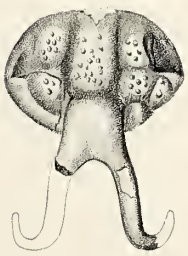
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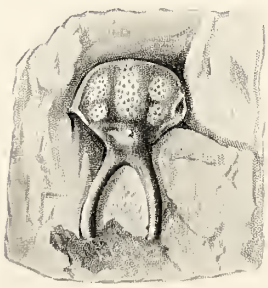
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# PLATE 80.

Page

Fig. 1 – 13. EURYPTERUS REMIPES. 404*

1. A young individual, dorsal side.
2. A young individual, ventral side; showing the anterior feet, the postoral plate, with the articulations of all the parts nearly entire.
3. A young specimen, showing the upper side of the body, which is entire, except the posterior spine and a part of the anterior feet.
4. A large individual of nearly the full size to which this species attains, lying upon its back, and having the lower or ventral side of the articulation removed; showing therefore the inner side of the carapace, and the articulations of the thorax and the abdomen. The anterior feet are partially preserved, and the swimming feet are entire, the lower side being shown. At *s*, *s* is the line of the suture by which a triangular piece is attached to the sixth joint, forming the fixed ramus of the chela, and over the upper surface of which the free extreme joint moves. The articulation of these parts with the body is not clearly shown, from the incompleteness of the specimen, the parts to which they were attached having been removed.
5. An individual preserving more than usual convexity of body. The head and eyes are very perfect : the anterior feet are lost, but the swimming feet are well preserved in all their parts, and the indented extremities are strongly marked. In the contraction of the extreme joint, the fixed branch of the chela below is nearly covered. In comparing the swimming feet in figures 4 and 5, it will be observed that in the former the lower side, and in the latter the upper or dorsal side, is seen.
6. A small carapace preserving the eyes.
7. The abdominal articulations and the posterior spine, separated from the thoracic rings.
8. An imperfect caudal spine, with the last two articulations of the abdomen.
9. The caudal spine : a lateral view of a specimen not quite entire. The lefthand is the dorsal side, and the general form is triangular, becoming more convex on each side of the dorsal edge towards the base.
10. The ventral side of a fragment, showing, on the lefthand side of the figure at *a*, the articulations of one of the swimming feet, with the large maxillary joint, which is nearly in its natural position, while the opposite one is displaced. The basal articulations of the anterior feet are likewise seen more distinctly than in any other specimen : the first and second are broken off, while the third is nearly entire, and preserves the minute spines on the lower side of each joint.
11. A fragment showing the inner side of several of the thoracic articulations, and preserving the anterior feet nearly entire, with the articulations of one of the swimming feet : the place of attachment of these is obscured by some of the plates of the body below.
12. The post-oral plate of this species.
13. An enlargement of the centre of the head of fig. 5, showing the small oculiform spots.

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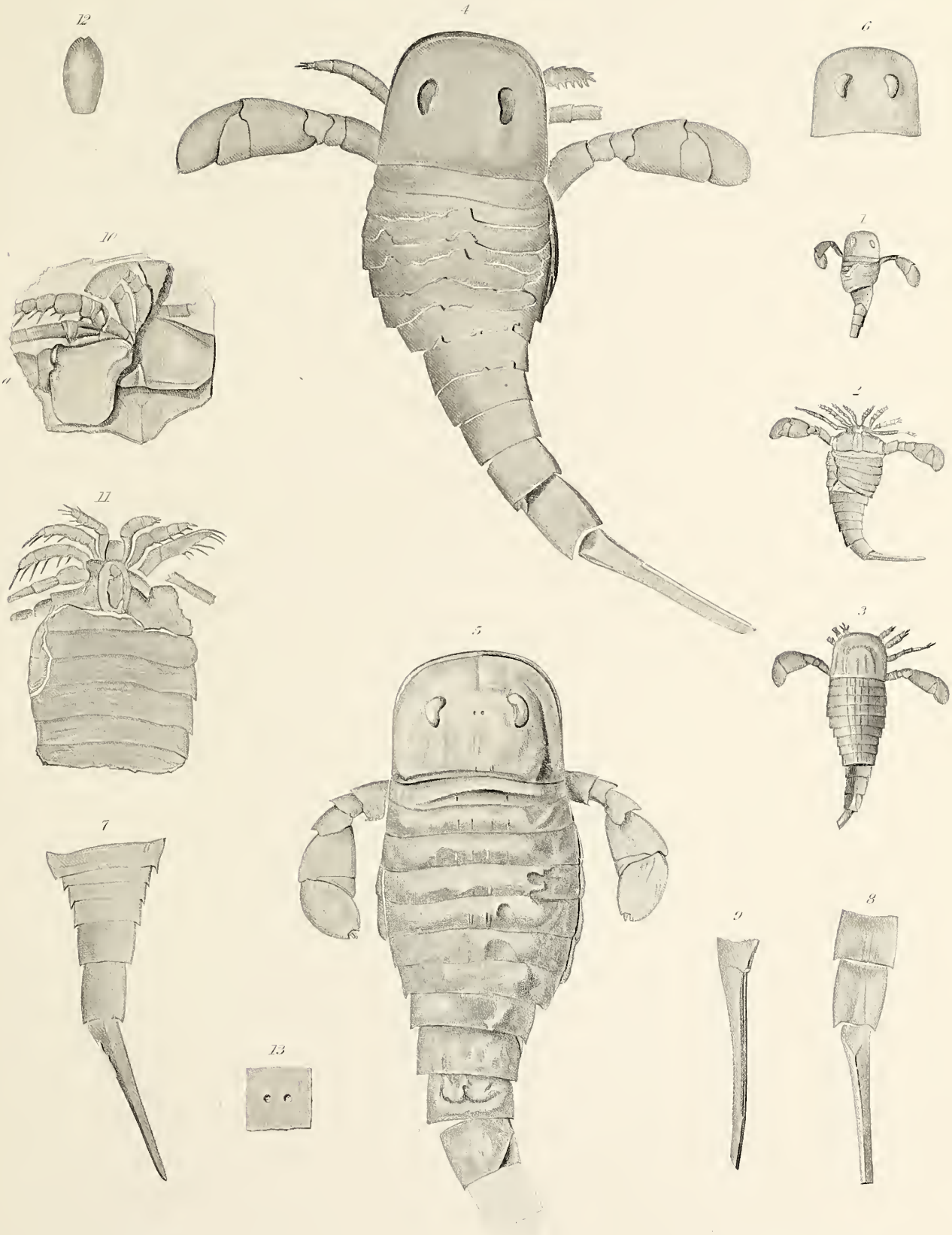


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# PLATE 80 A.

Page

Fig. 1 – 6, & 11 – 17. EURYPTERUS REMIPES. 404*

1. The ventral side of an imperfect specimen preserving the thoracic segments and four of the abdominal joints, with the impression of one of the swimming feet entire, and the other with the penultimate joint separated. Impressions of the maxillary plates remain, showing their original form, as also the form of the post-oral plate. The bases of the four anterior pairs of feet still remain, showing the place of their origin.

   The last joint of the foot appears in this individual to slide over the triangular piece of the preceding joint upon the lower side, which is not true : this appearance arises from the fact that it is a mould of the upper or dorsal surface of this organ.

2. A part of the head of this species, showing part of the three first feet, while the fourth is entire.

3. A dissected swimming foot, showing its attachment to the maxillary plate, the form and proportions of the joints, and mode of articulation.

4. The broad terminal joint of the swimming foot, showing the notch at the extremity and the small terminal palette. These separated joints are of not unfrequent occurrence in strata where the EURYPTERUS is found.

5. A transverse section of the abdominal portion of one of these fossils : the section is oblique to the body, and the appearance indicates that it has suffered little from compression.

6. A fragment of a crustacean associated with the *E. remipes* at Waterville, the relations of which have not been determined.

11. A small carapace of *E. remipes*, with the first thoracic segment.

12. The lower surface of one side of the cephalic shield.

13. The post-oral plate of *E. remipes*.

14. The same organ of *E. robustus*.

15. The anterior portion of the same organ (a fragment) of *Dolichopterus macrocheirus*.

17. The same organ, copied from the specimen figured on Plate LXXXIII A.

16. The same organ of *Pterygotus osborni*.

Fig. 7. EURYPTERUS MICROPHTHALMUS. 407*

7. The carapace, natural size, preserving a part of the first joint of the thorax.

Fig. 8. PTERYGOTUS MACROPHTHALMUS. 418*

8. The carapace, natural size.

8 *a*. A small portion enlarged, to show more distinctly the oblong tubercle, and the small eye-like spots which are faintly visible to the naked eye.

Fig. 9. PTERYGOTUS OSBORNI. 419*

9. A figure of the specimen, natural size. A reference to the parts of EURYPTERUS will explain the relations of the parts of this figure.

Fig. 10. CERATIOCARIS ACULEATUS. 422*

10. The posterior joint of the body and tail-spines.

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# PLATE 81.

Page

Fig. 1 – 11. EURYPTERUS LACUSTRIS. 407*

1. A young individual, preserving but one of the larger appendages on one side : the posterior spine is broken off near the distal extremity.
2. An individual of medium size, preserving all the articulations of the body, the fourth foot, and one of the swimming feet imperfect.

   The specimen lies upon the stone with the back downward, and the crust from the lower side is almost wholly removed, so that the inner sides of all the parts are seen, and the cavities of the eyes. The last joint of the swimming foot is separated at the articulation *r;* and the suture at the base of the fixed ramus of the chela, which is naturally solid, is slightly separated *s*. The other joints are somewhat distorted by pressure, which has been directed from below upwards. On the right side of the figure, and on the last articulation, there are small portions of the ventral crust remaining. In this specimen, the interior of the crust being seen, the imbrication of the rings of the body is reversed.
3. The exterior of a head or carapace of a larger individual, which preserves the eyes.
4. The two posterior annulations of the body, with the caudal spine attached. The specimen lies with the dorsal side downwards; the ventral crust being removed from the annulations, and the lower *concave* side of the spine is shown.
5. A separated caudal spine, showing the lateral and lower sides. The specimen is much compressed.
6. The ventral side of the body, preserving nine of the segments : the two upper are joined by a close suture, and sustain a locomotive [?] appendage.
7. The upper thoracic segment separated from the body, and scarcely showing the suture line : the articulated appendage is imperfect.
8. A very large thoracic segment, showing the suture line and the appendage before mentioned, from which the lower articulations are separated. The continuation is drawn from the one shown in fig. 6.
9. A single articulation of the thorax. The line near the upper margin, including a portion which is broken off, indicates the extent of the imbrication of the next superior segment.
10. A part of a segment which is longitudinally divided; a feature shown along the dorsal line in several articulations in another nearly entire individual. It is probable that this dehiscence of the rings along the back is connected with the process of casting the crust.
11. A portion of the surface of fig. 8 enlarged.

# WATER-LIME GROUP.



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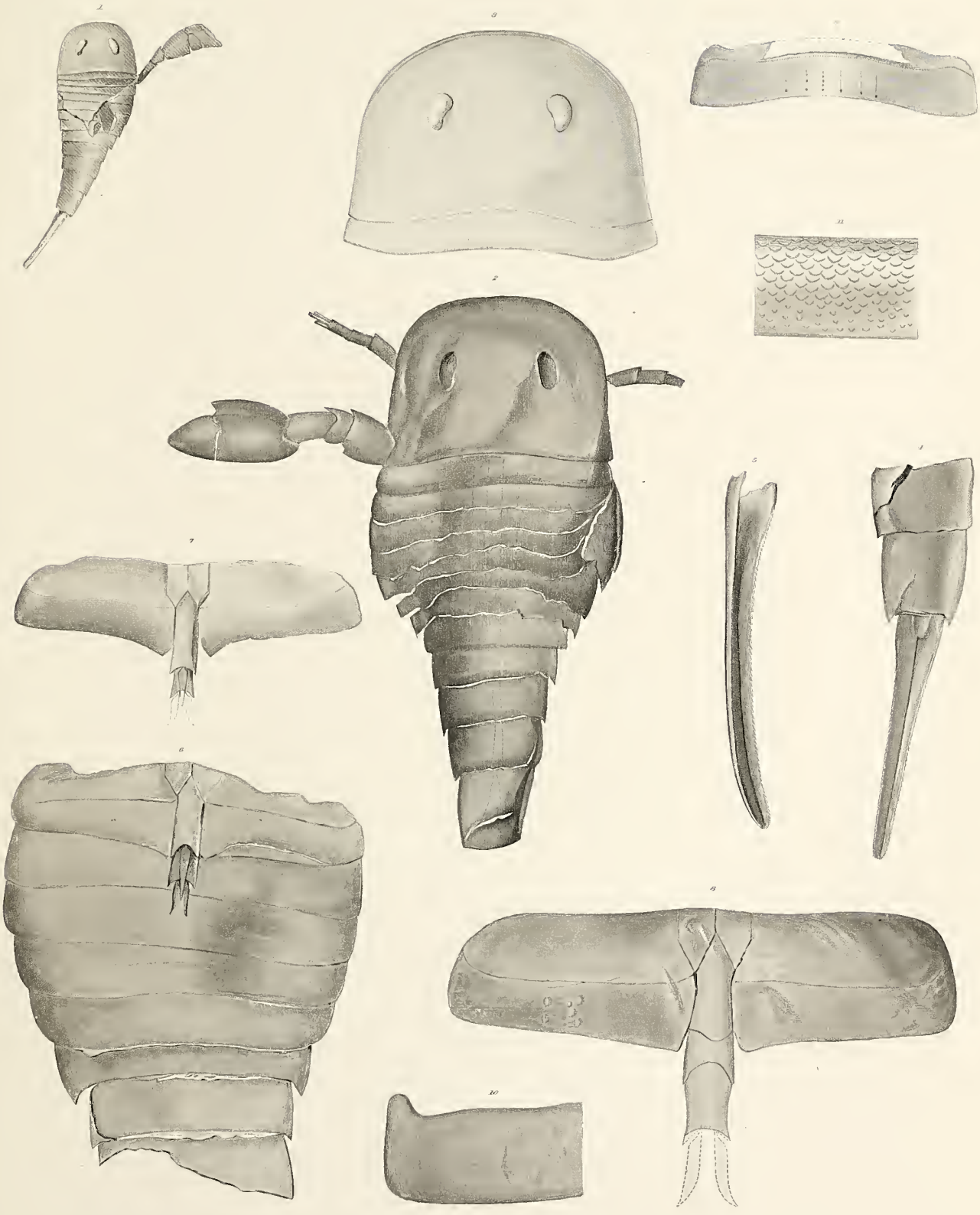


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# PLATE 81 A.

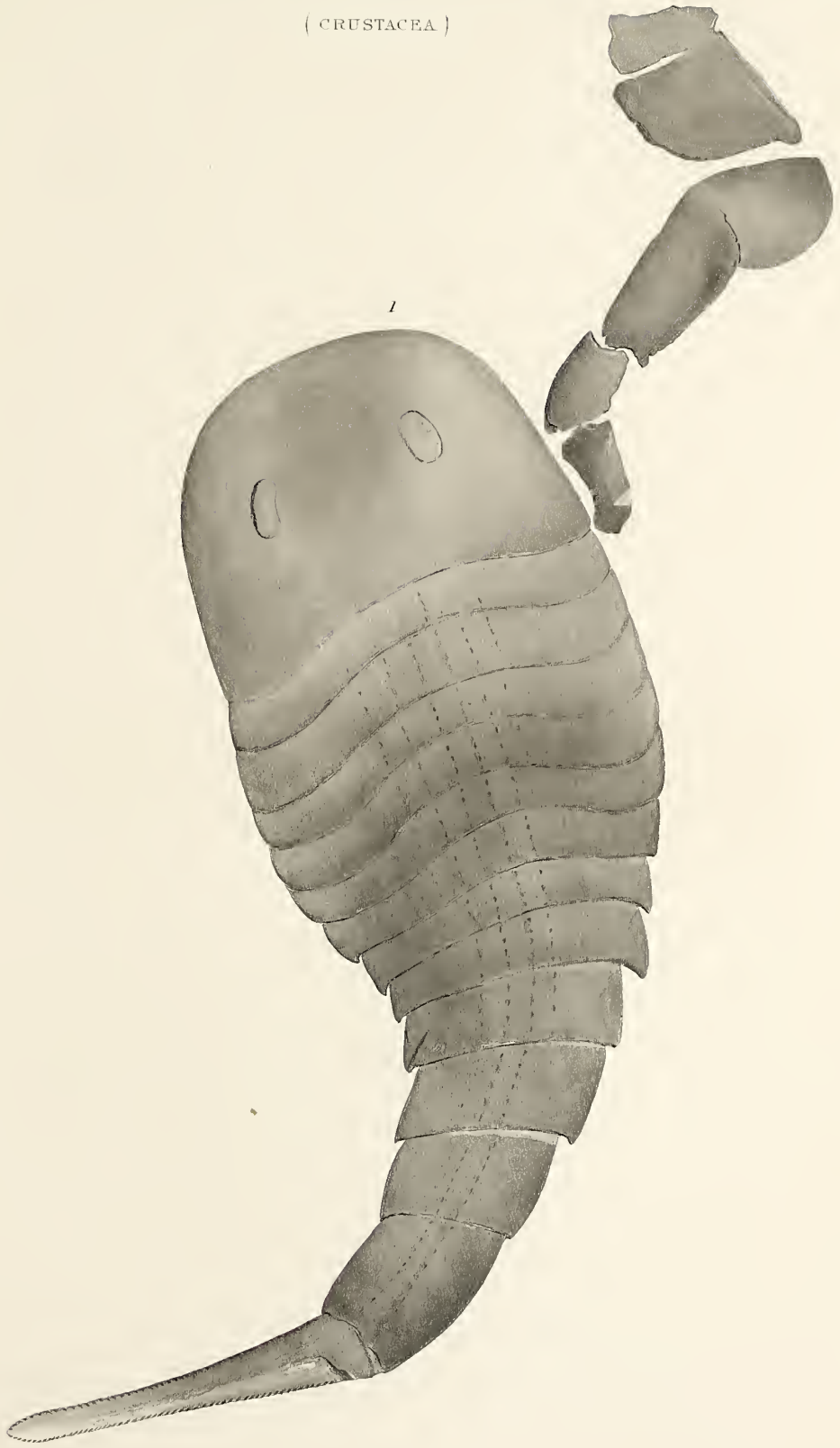
Page

Fig. 1. EURYPTERUS LACUSTRIS. 407*

1. A large individual which is deprived of the appendages, except one dismembered swimming foot. The specimen is compressed, and the little pustule-like scales have the appearance of pores in the crust. [These have been very incorrectly represented in the drawing; there being but two rows, and these not parallel, on the six posterior joints, while the six rows are but indistinctly visible on a few of the thoracic segments.]

Individuals of this species frequently attain a larger size than this, as seen in other figures.

( CRUSTACEA )




F. B. Meek Del

John E. Gavit Sc.

# PLATE 81 B.

Page

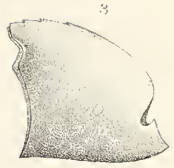
Fig. 1 – 4. EURYPTERUS LACUSTRIS. 407*

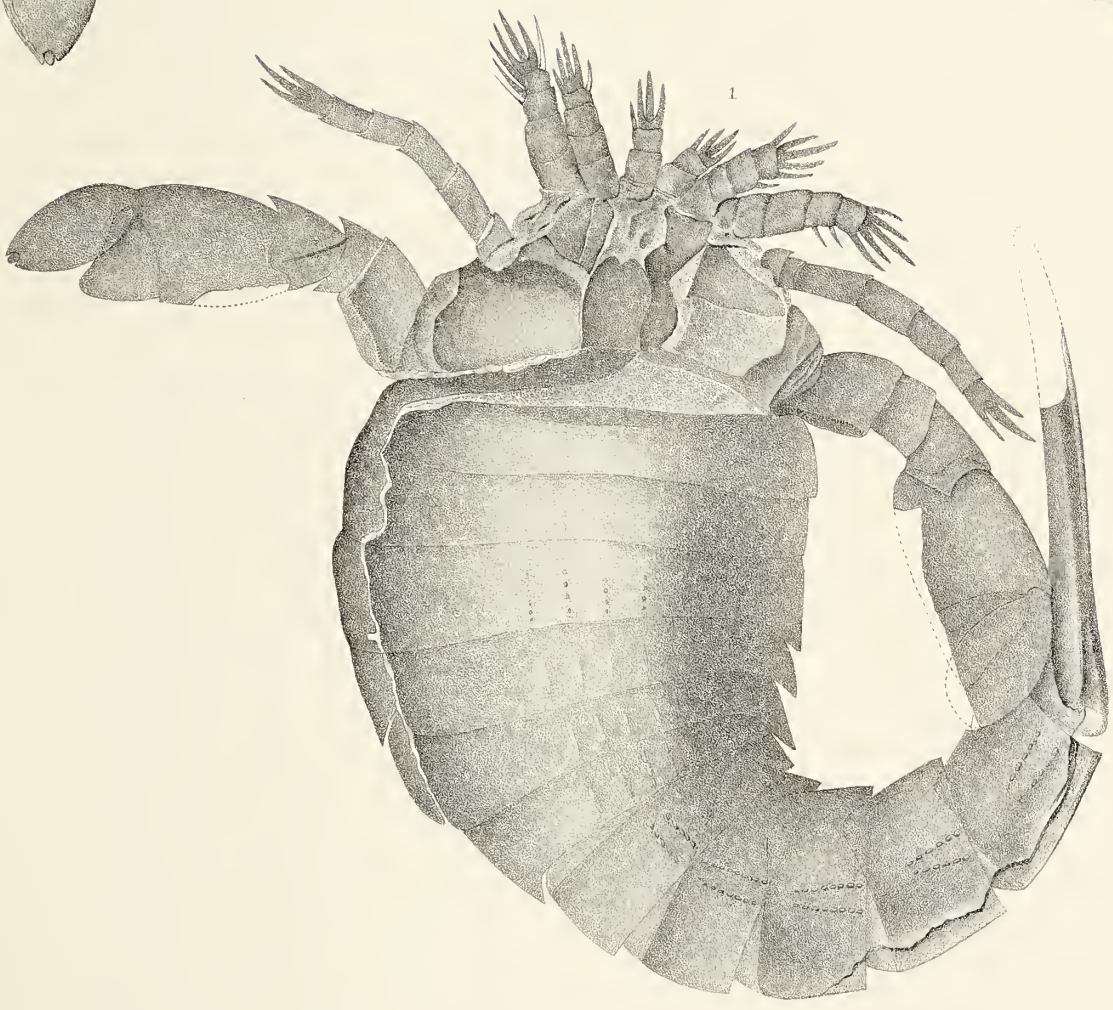
1. A specimen of medium size, lying with the dorsal side exposed. The carapace has been broken off, showing the inner side of the maxillary plates. the post-oral plate, and the four anterior pairs of feet, which are obscured at their bases. The body is curved, and the tail-spine directed forwards. The pustuliform scales upon the back are in four rows on the thoracic joints, and two slightly diverging rows on the abdominal joints.
2. The last joint of the swimming foot, with the minute palette at the extremity.
3. The seventh joint of the swimming foot, having the triangular chelate extension separated at the suture.
4. The first articulation of the ventral side, with the organs attached

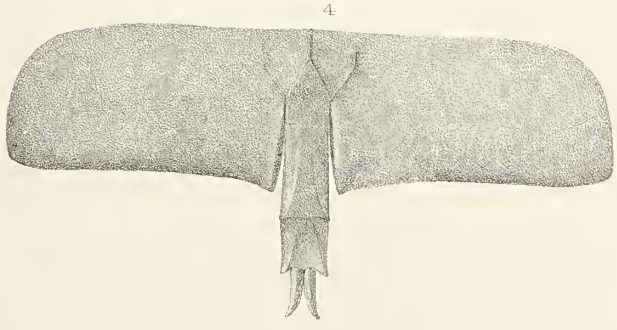
# WATERLIME GROUP.



(CRUSTACEA.)




R.P.Whitfield, del.

Swinton, lith.

# PLATE 81 C.

Page

Fig. 1. EURYPTERUS ROBUSTUS*. 410*

1. View of the specimen from the lower side.
2. The ventral side of another specimen of this species, from the collection of Prof. J. S. GARDNER of Whitesboro' (N.York), showing more distinctly the fracture or dehiscence across the segments, indicating the specimen to have been a cast crust†.

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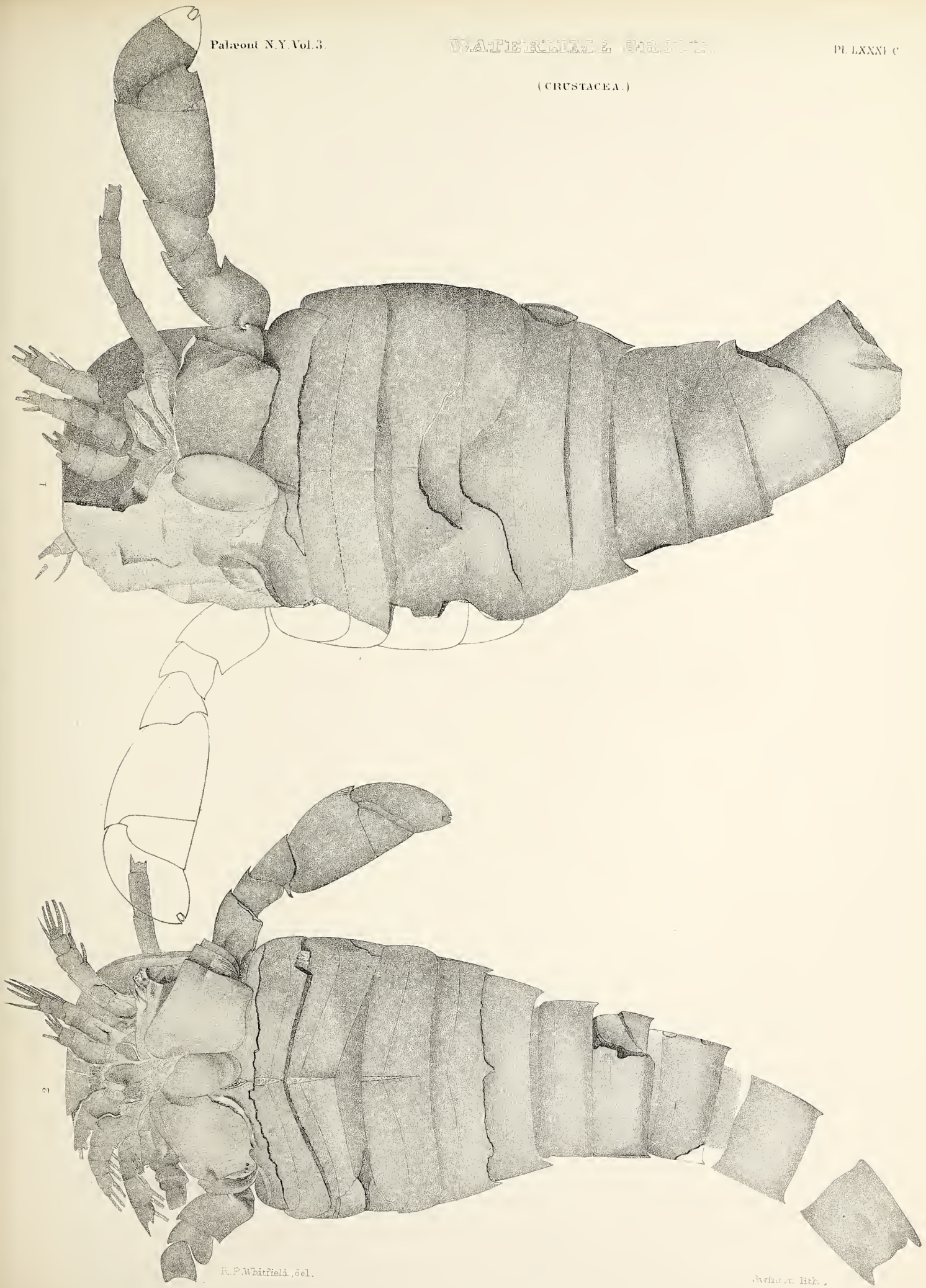
* A farther examination, with other specimens, has shown that the form referred to *E. lacustris*, var. *robustus*, has the characters of a distinct species.

† Some copies are without this figure.

(CRUSTACEA.)



R.P. Whitfield, del.

Sarony & Major, lith.

# PLATE 82.

Page

Fig. 1. EURYPTERUS DEKAYI. 411*

1. An individual, natural size, with the dorsal side upwards. One side has been broken off; and this portion, with the swimming foot, is restored in outline, the same organ on the left side being essentially entire. The upper part of the carapace and the first joints are removed, so as to show the maxillary plates, the postoral plate and the bases of the anterior feet, which are broken off so as not to extend beyond the margin of the carapace. The thoracic appendage is shown in its junction with the first ventral joint, and extending to the base of the fourth joint.

(CRUSTACEA.)

# PLATE 82.*

Page

Fig. 1 – 3. EURYPTERUS PACHYCHEIRUS. 412*

1. The body of an individual of this speeies, preserving eight or nine artieulations of the thorax and abdomen. The surface is strongly marked by the seale-like faeets, and the artieulations are coarse and strong.

1 *a*. A portion of the erust enlarged, showing the surfaee markings.

2. A fragment of stone upon whieh are preserved two swimming feet, the anehylosed ventral thoraeie segment, and some portions of the anterior feet. These appear to be the remains of a large individual, whieh has been broken up, and the parts separated. The swimming foot 2 *a* shows the lower side, and the joints are partially separated; and fig. 2 *b* shows the lower side of the other foot, also in a reversed position.

2 *c* is the fragment of one of the anterior feet, and fig. 2 *d* is the same plaeed in a natural position : the length of the spines is a very eharaeteristic feature.

2 *e* is the anehylosed first and seeond segments on the ventral side, preserving the thoraeic appendage. The speeimen is worn, and the line of suture is seareely perceptible.

3. A separate swimming foot, preserving the five outer joints.

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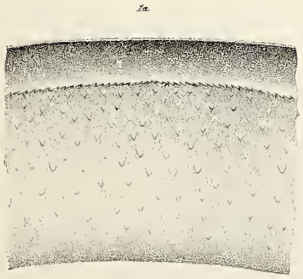
* PLATE LXXXII. This plate should properly have been Plate LXXXII A; but the letter A has been accidentally omitted both in the text and on the plate.

# WATERLIME GROUP.

(CRUSTACEA.)




R.P. Whitfield del.

Swinton, lith.

# PLATE 83.

Page

Fig. 1. DOLICHOPTERUS MACROCHEIRUS. 414*

1. The dorsal side of the specimen, preserving ten joints and a part of the eleventh joint of the body.

# PLATE 83 A.

Page

Fig. 1. DOLICHOPTERUS MACROCHEIRUS. 414*

1. The ventral side of the specimen as it lies on the surface of the stone.

# WATERLIME GROUP.

(CRUSTACEA.)

R. Whitfield del.

Sw.ir.com. lith.

# PLATE 83 B.

Page

Fig. 1. EURYPTERUS PUSTULOSUS. 413*

1. The specimen, natural size.

Fig. 2. EURYPTERUS REMIPES. 404*

2. The carapace and three articulations of the body of *E. remipes*, for comparison with the form of carapace of *E. lacustris* on same plate.

Fig. 3. EURYPTERUS LACUSTRIS. 407*

3. The carapace of a large individual, showing the form to be distinct from fig. 2, which is the carapace of *E. remipes*.

Fig. 4. PTERYGOTUS COBBI. 417*

4. The free ramus of the chelate appendage of this species.

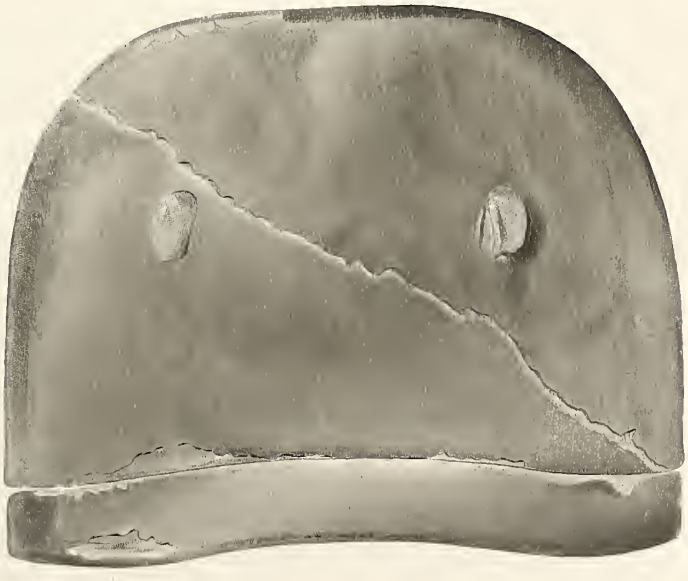
(CRUSTACEA)

1

4

2

3



# PLATE 84.

Page

Fig. 1 – 5. CERATIOCARIS MACCOYANUS. 421*

1. A specimen preserving the tail-spines, several articulations of the body, and a part of the carapace, the body having been folded between the valves of the latter.
2. A specimen in similar condition, preserving one side of the carapace more nearly entire.
3. A fragment preserving the tail-spines, with two or three of the articulations.
4. A similar fragment.
5. A similar but larger fragment.

Fig. 6. CERATIOCARIS ACUMINATUS. 422*

6. The left valve of the carapace of this species.

Fig. 7. CERATIOCARIS : sp.? 422*

7. A crushed specimen preserving the mutilated carapace and several of the articulations, but too indistinct for determination : it may be identical with the preceding.

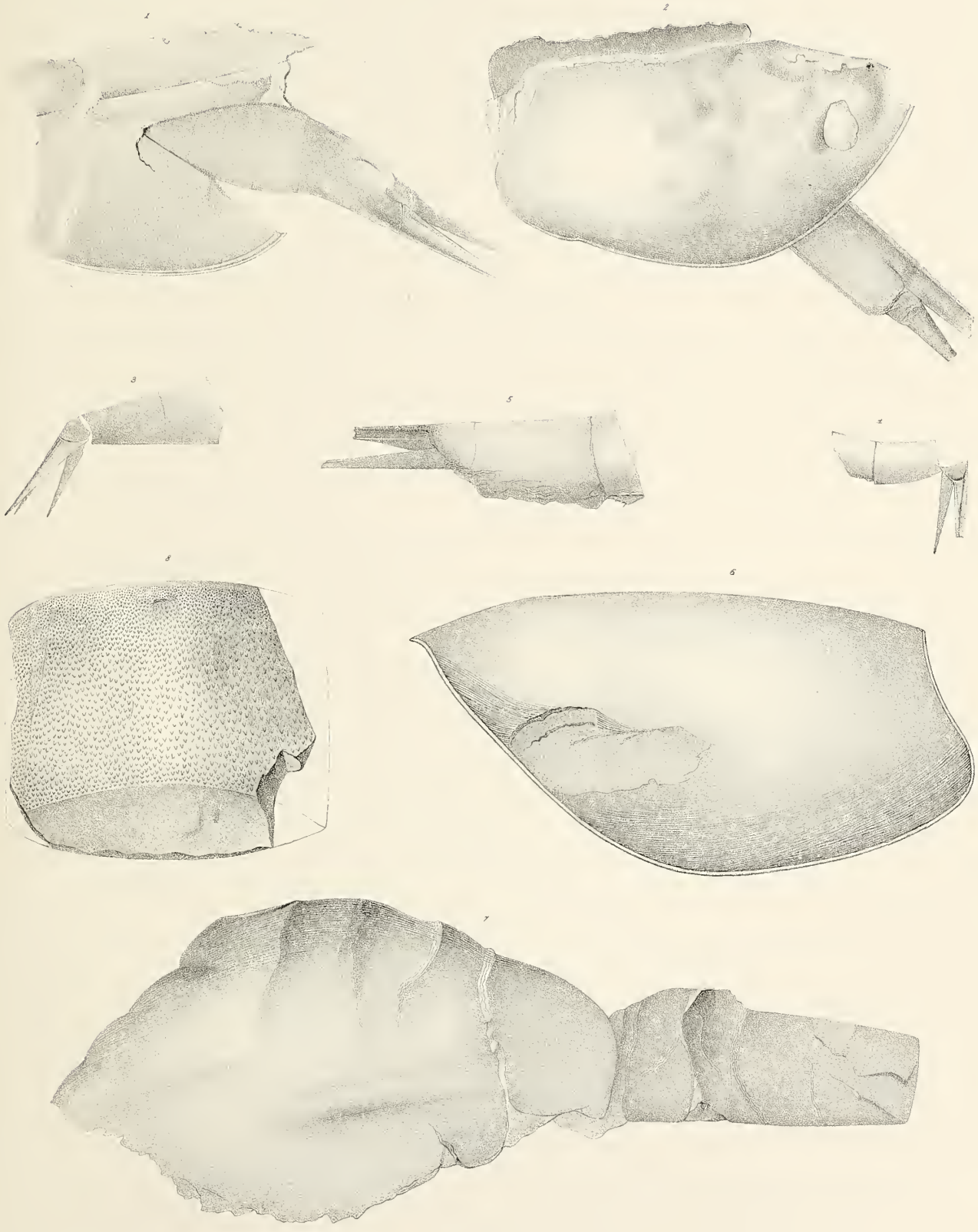
Fig. 8. PTERYGOTUS COBBI? 417*

8. An articulation of the abdomen, which probably belongs to this or to some other species of the genus.

# WATERLIME GROUP.

(CRUSTACEA.)





# PLATE 84 A.

Fig. 1 & 2. Restoration of the form and appendages of EURYPTERUS REMIPES.

The parts represented are not in any respect imaginary, but have all been seen in different individuals or parts of individuals, and are known to have the relations here expressed.

Fig. 1. A dorsal view. The parts and surface-markings have been described in reference to figures of preceding plates.

Fig. 2. The ventral side, showing the position of the mouth and oral appendages, the two swimming feet, the postoral plate, and the organ before referred to as a locomotive appendage, but which I suppose may have borne the generative organs, as in the similar appendage of LIMULUS, and of other crustaceans, upon the corresponding segment of the body.

Fig. 3. SAPPHIRINA GEMMA, after DANA.

Fig. 4. A figure showing the mouth and bases of the feet of a female LIMULUS, the two anterior tentacles, etc.

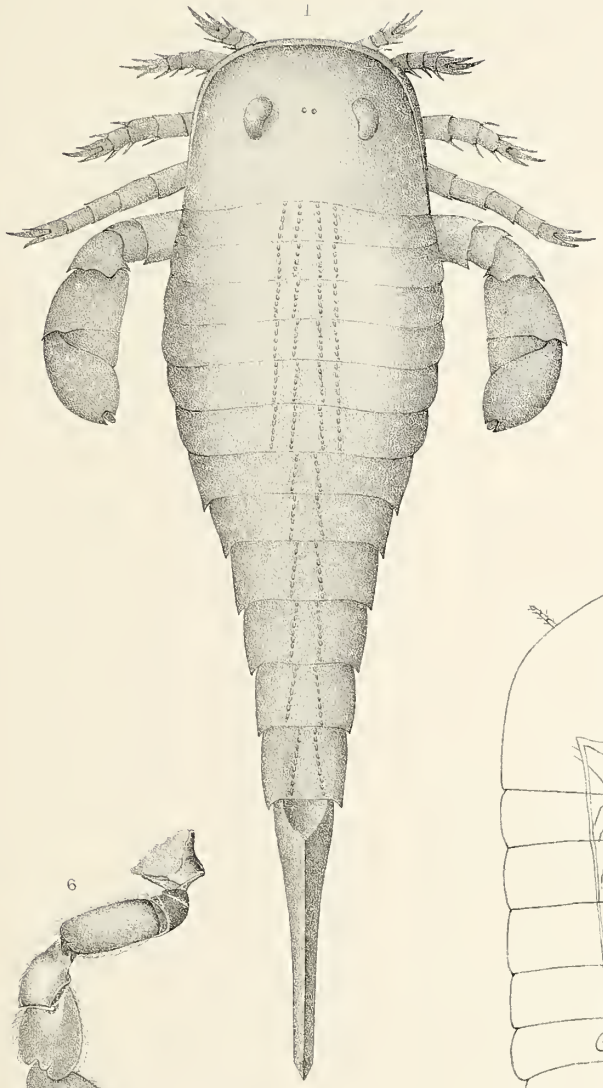
Fig. 5. The membranous leaflet placed posteriorly to the mouth in LIMULUS, and regarded as the anchylosed sixth pair of feet. The posterior extremities probably perform the same functions as the extremities of the appendage behind the postoral plate in EURYPTERUS. *See* Note, page 399.

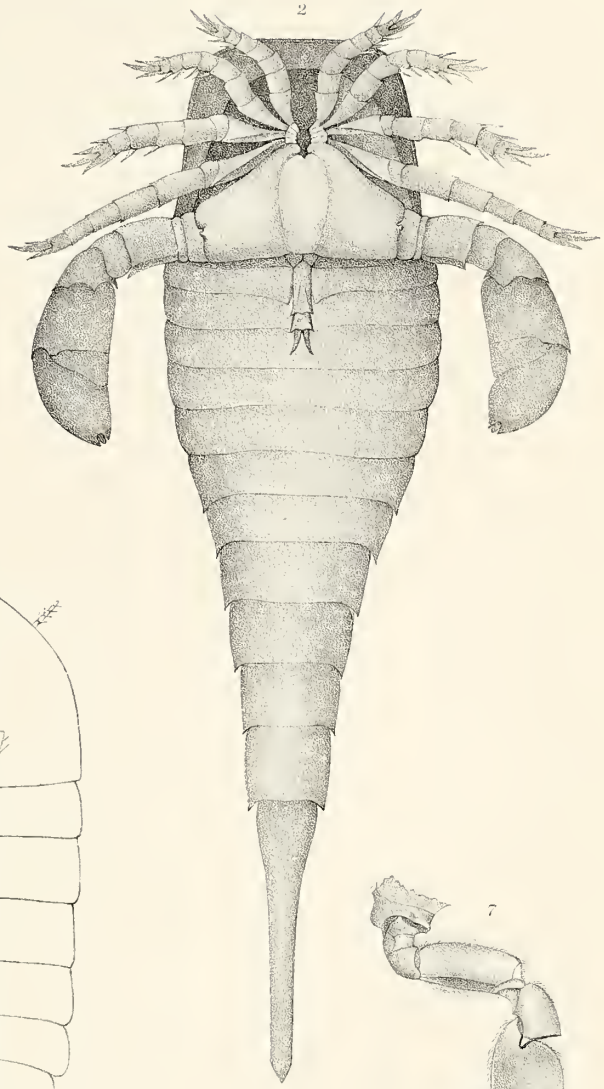
Fig. 6 & 7. PLATYONICHUS OCELLATUS.

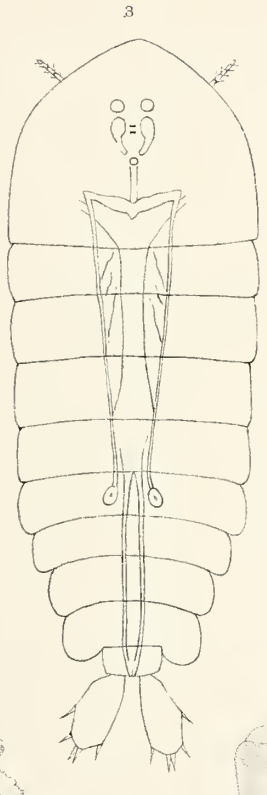
A representation of the upper and lower sides of one of the hinder or swimming feet (the fifth pair) of this crustacean, which is a common species upon our coast, for comparison with the corresponding pair in EURYPTERUS.

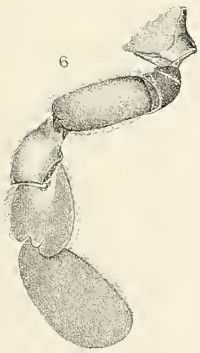
RESTORATIONS OF EURYPTERUS,

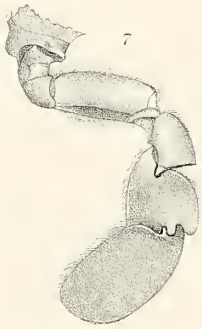
AND COMPARATIVE ILLUSTRATIONS OF RECENT CRUSTACEA.

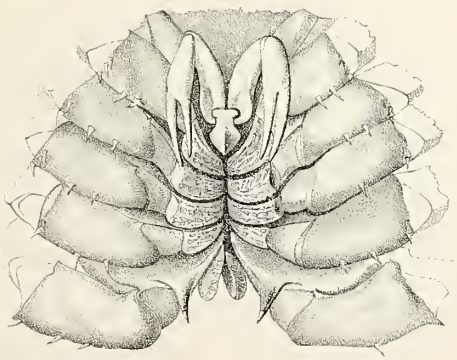


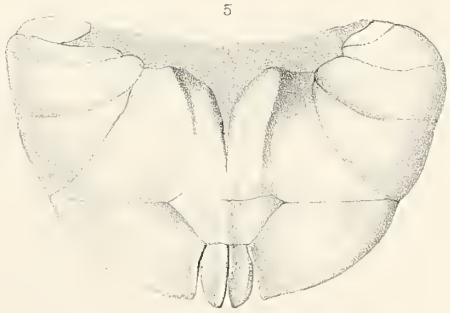



# PLATE 85.

Page

Fig. 1 – 18. TECHNOCRINUS SPINULOSUS. 140

1. The body and bases of the arms, with a portion of the column attached.

2. Diagram of the structure of the body to the base of the arms, as far as determined.

3 – 14. Figures of separated plates from different parts of the body, showing the form, ridges, spines, etc.

13. (The lower fig. 12 on plate should be 13.)

15 – 18. Joints of the column, showing absence of nodes in some, and varying degrees of development in others.

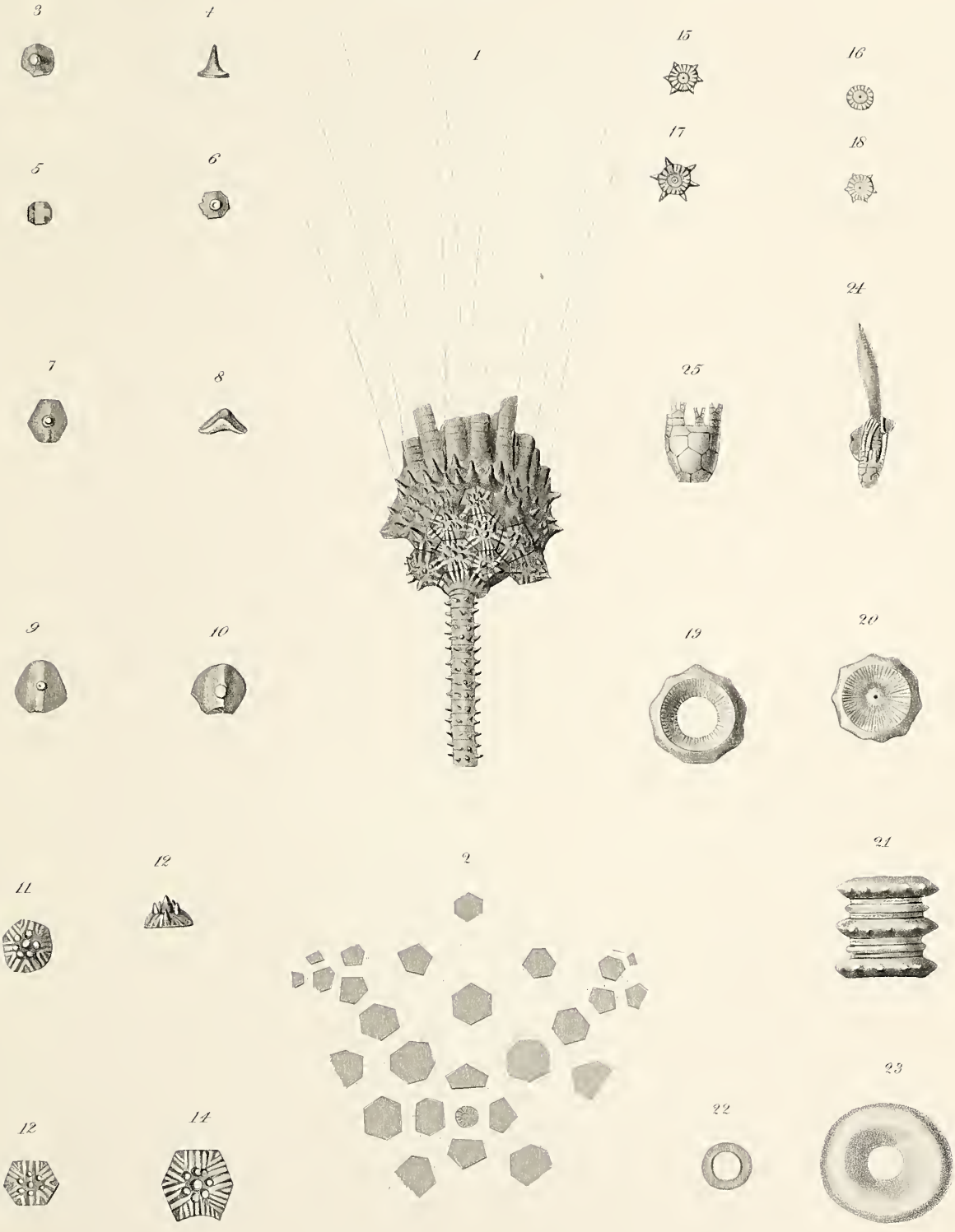
Fig. 19 – 23. Columns and plates of undetermined CRINOIDEÆ. 145

Fig. 24 & 25. HOMOCRINUS PROBOSCIDALIS. 138

24. The specimen, natural size.

25. Enlargement of the body and bases of the arms.

(CRINOIDEÆ)




E.B.Cook Del.

Engraved & Printed by J.E. Gavit

# PLATE 86.

Page

Fig. 1 – 4. TECHNOCRINUS ANDREWSI. 141

1. The specimen, natural size, preserving the body, and on one side a part of the arms and a portion of the column.

1 *a*. Diagram illustrating the structure from the base to the lower part of the arms (for comparison with structure of *Mariacrinus pachydactylus* and *M. plumosus*, Plate iii).

2 & 3. Fragments of columns apparently of this species.

4. Section of column fig. 3.

Fig. 12 & 5 – 11. TECHNOCRINUS STRIATUS. 142

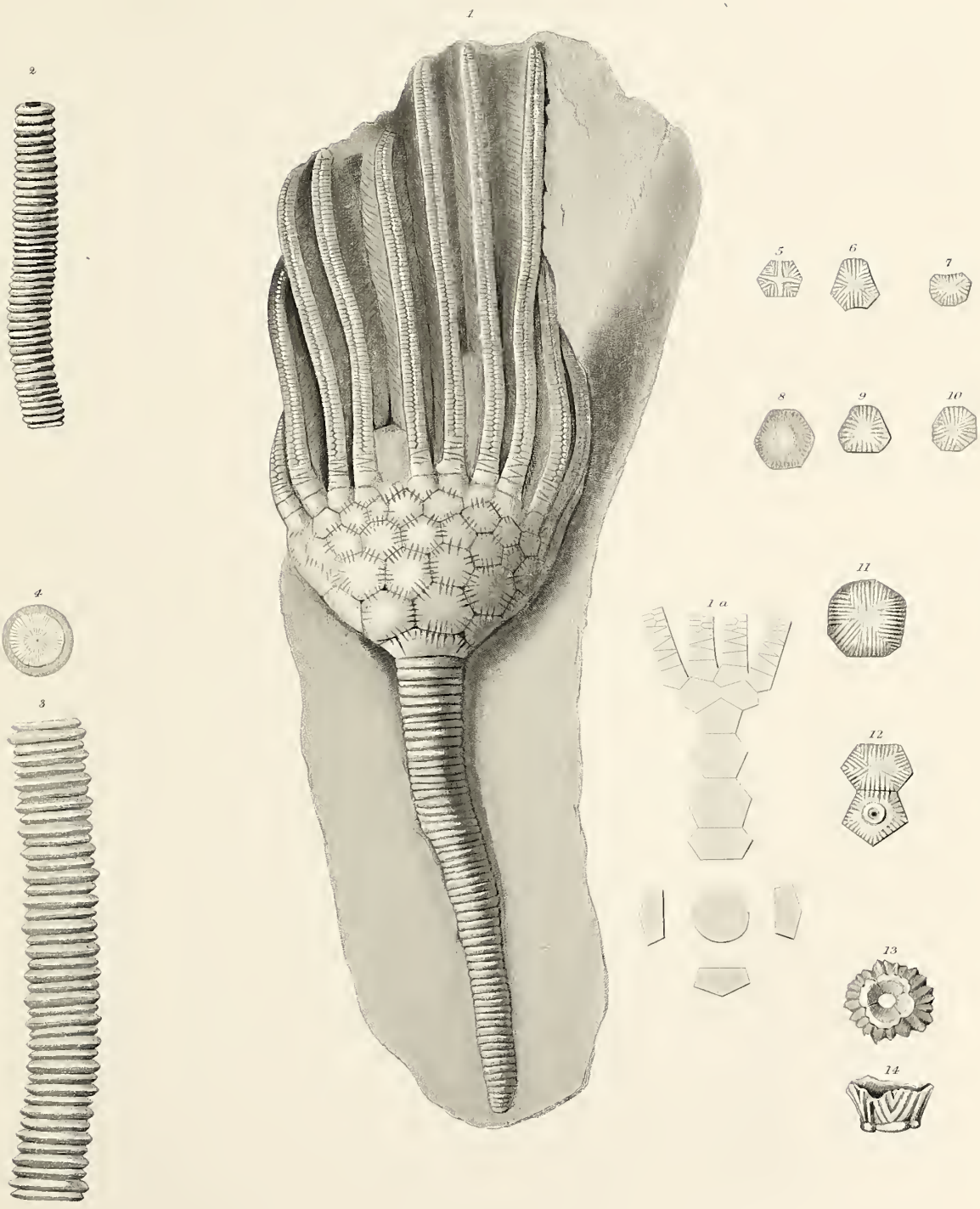
12. The basal plates anchylosed together with a small portion of the column attached, and also one first radial plate.

5, 6, 7, 9, 10 & 11. Several plates of different series belonging to this species.

Fig. 13 & 14. TECHNOCRINUS SCULPTUS. 143

13 & 14. Basal and lateral view of the lower part of the body.

CRINOIDEÆ




F. B. Meek, Del.

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# PLATE 87.

Page

Fig. 1 – 22. EDRIOCRINUS SACCULUS. 143

1, 2, 3. The young growing singly and in groups of two and three, preserving the radial plates above the base, which is still expanded below at its point of adhesion.

4, 5, 6 & 7. The bases of several individuals, showing the marks of adhesion below, and having forms more or less elongated and slightly distorted.

8. The base of a specimen, still showing the mark of adhesion.

9. The base entirely rounded, and with the radials and first arm-plates attached.

10. An individual nearly entire, having a part of the base broken off, but preserving the radial plates with the arms more or less entire.

11. Diagram of the structure, showing the base, radial and anal plates, and first plates of the arms

12, 13, 14 & 15. Lateral and interior views of two very symmetrical bases of this species.

16, 17 & 18. A specimen much elongated below, and one of nearly hemispheric form.

19 & 20. Lateral and interior views of a remarkably elongated specimen, which may perhaps prove a distinct species.

21 & 22. Lateral and basal view of a specimen presenting an appearance as if the upper one had grown from the interior of the base of a preceding individual.

# ORISKANY-SANDSTONE.



(CRINOIDEÆ)

F.B. Meek. Del.

John P. Gavit. Sc. Albany. N.Y.

# PLATE 88.

Page

Fig. 1 – 4. ANOMALOCYSTITES DISPARILIS. 145

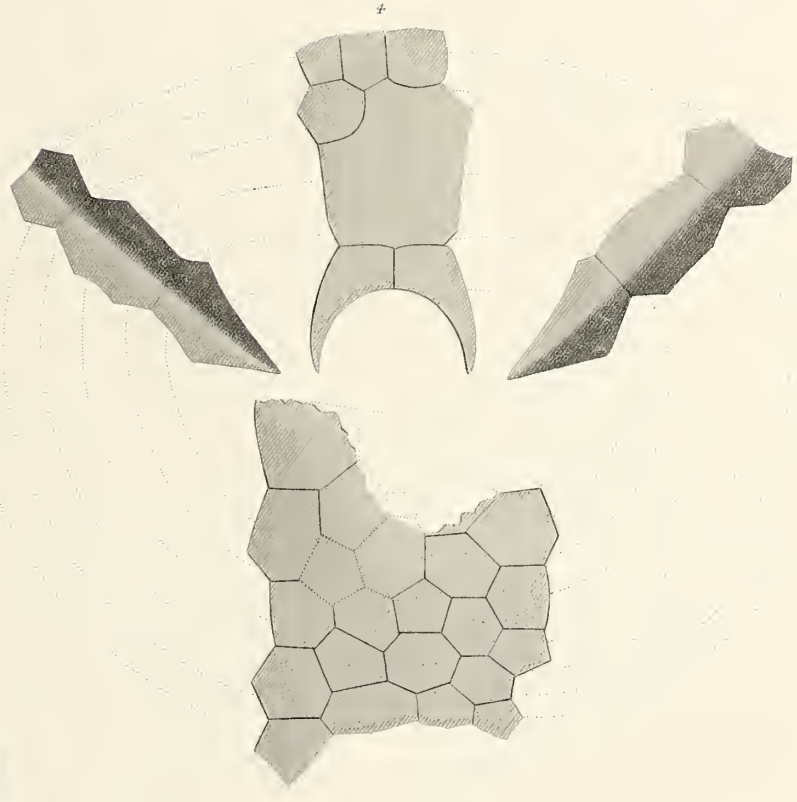
1. Anteal or concave side, showing the deeply arched or crescentform base with the succeeding plates.
2. Posteal or convex side, showing the form and arrangement of plates.
3. Lateral view of the same specimen..
4. Diagram illustrating the structure of the body, showing the deep indentation for the insertion of the column : *a*, plates of the anteal or concave side; *p*, plates of the posteal or convex side; *r*, *r*, the lateral or radial plates, which are shaded to indicate the abrupt angles, one part of the plate serving to make up the convex and the other the concave side.

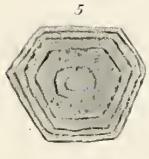
Fig. 5 – 9. Plates of undetermined Crinoidian or Cystidian bodies. 147

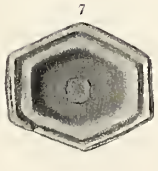
# ORISKANY SANDSTONE.

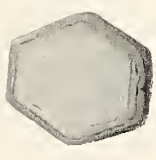


(CRINOIDEÆ)





A. F. B. Meek. Del.

John E. Gavit, Lith. Albany, N.Y.

# PLATE 89.

Page

Fig. 1 – 4. ORTHIS HIPPARIONYX. 407

1 *a*. A dorsal valve which retains a small portion of the shell. The direction of the striæ upon the hinge-margin is very well shown.

1 *b*. Profile view of the same.

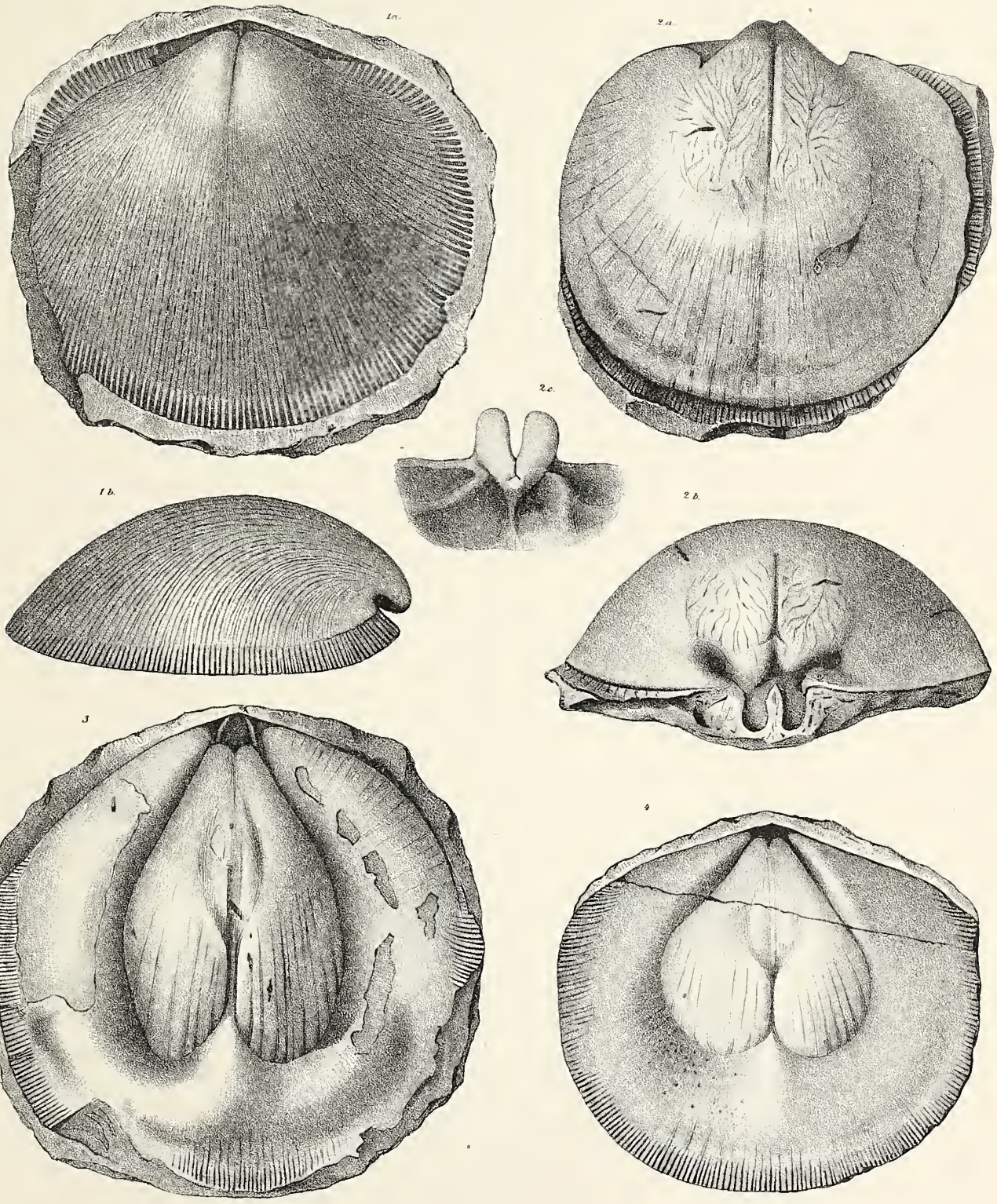
2 *a*. A similar cast, showing the vascular impressions upon the surface of the more prominent portions, and likewise towards the anterior margin.

2 *b*. Profile of the same from the cardinal side.

2 *c*. The interior of the upper part of the dorsal valve and brachial processes, as shown in a mould from the preceding figure.

3. A very old specimen, in which the muscular impression is extremely elongated.

4. The cast of a shell of medium size, preserving the muscular impression in its usual symmetrical form.




On Stone by. Swinton.

Lith.of Rich.d H. Pease Albany

# PLATE 90.

Page

Fig. 1 – 7. ORTHIS HIPPARIONYX. 407

1. Cast of the dorsal valve of a younger specimen than that of the preceding plate.
2. Cast of the ventral valve of a specimen of medium size, showing the lower part of the muscular impression but faintly developed.
3. A similar specimen, which preserves a portion of the shell.
4. An older specimen, in which the cast of the muscular imprint is perfectly preserved.

5 & 6. The interior and the cast of a very old shell.

7. A portion of the surface striæ enlarged.

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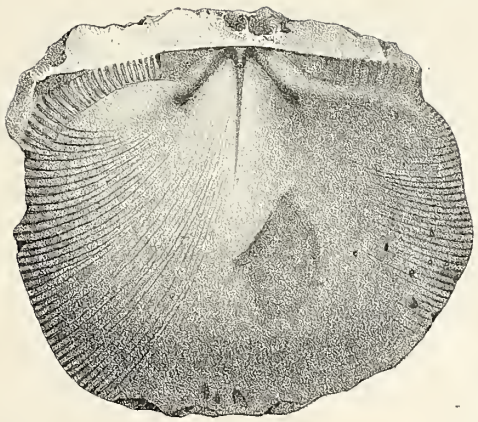

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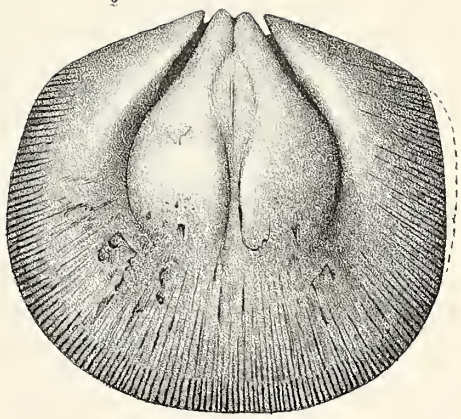

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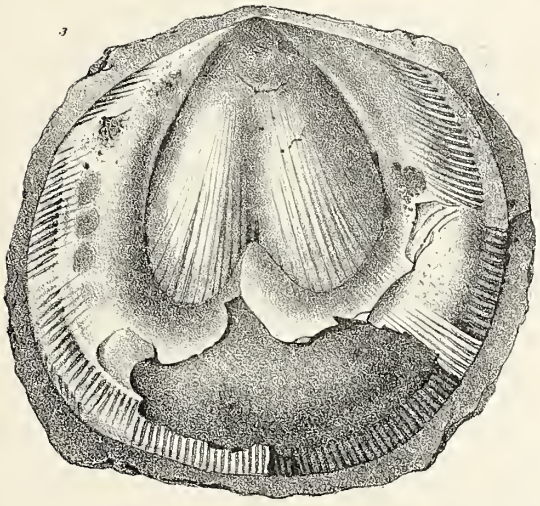

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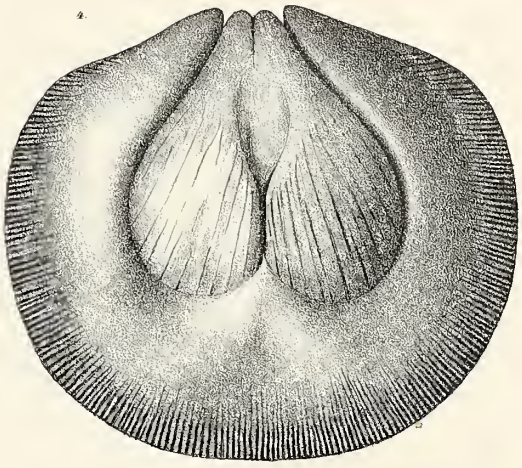

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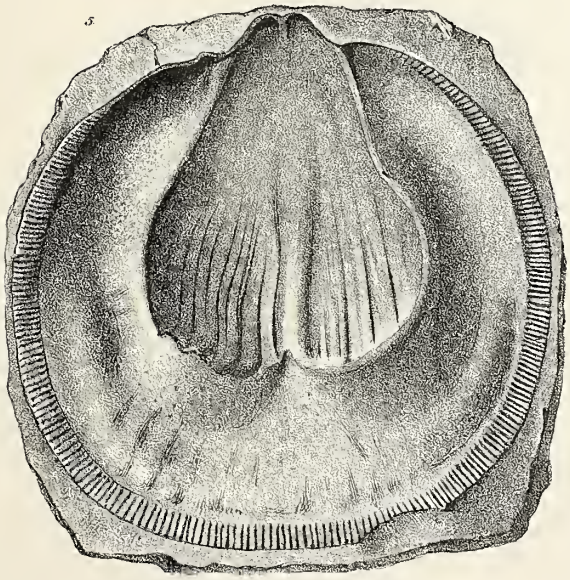

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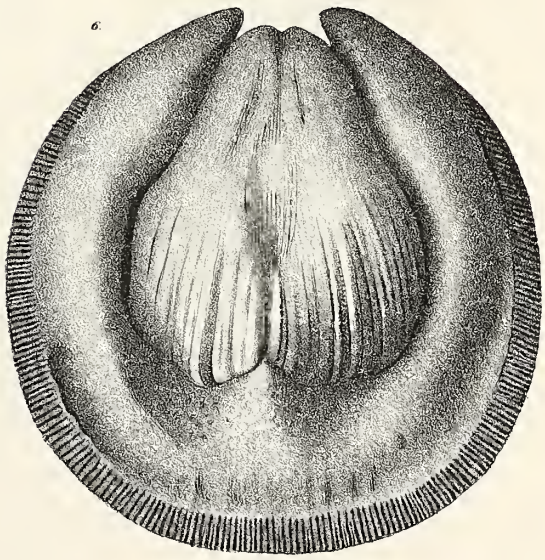
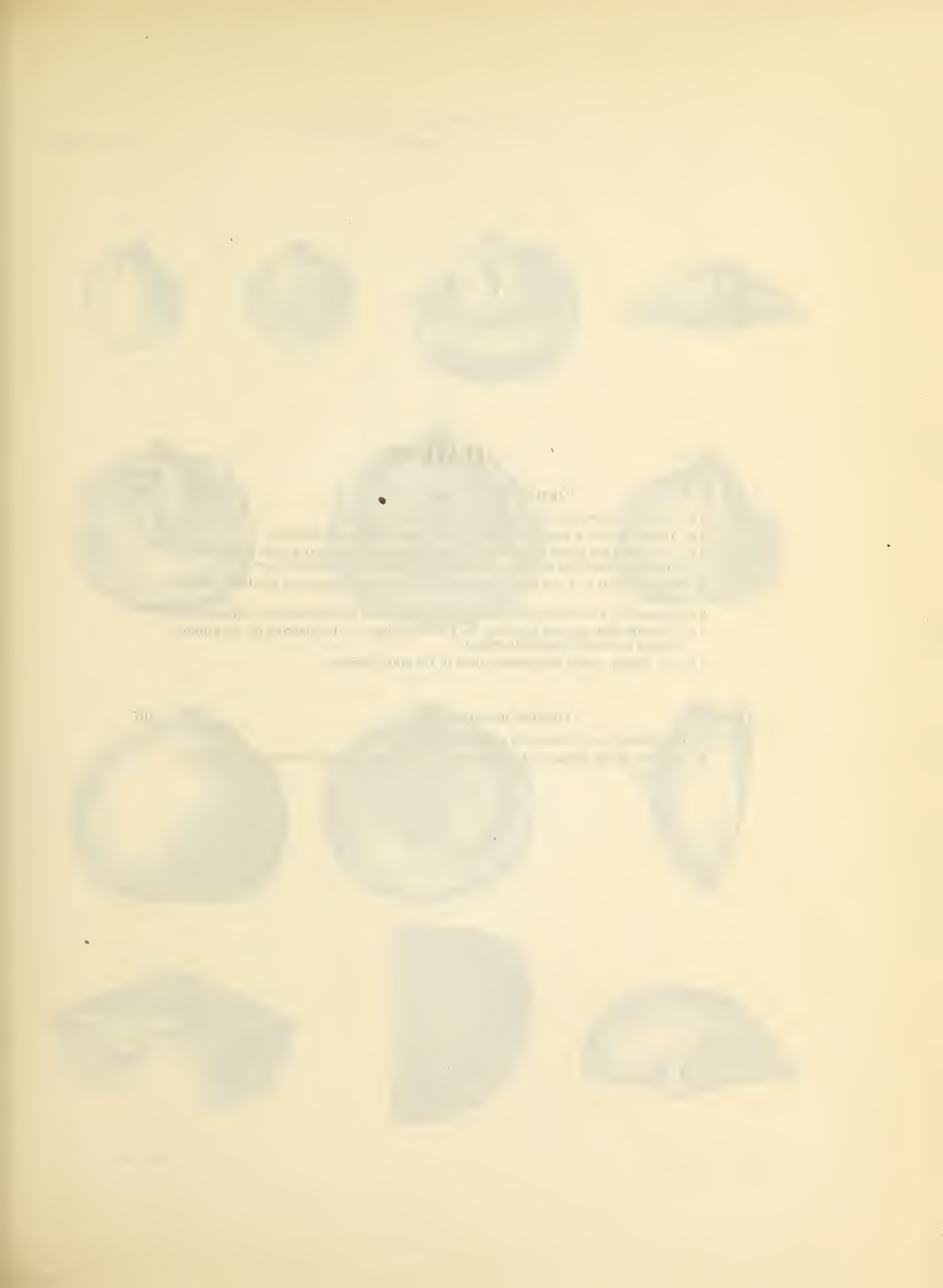


On Stone by. Swinton

Lith. of Rich^d H. Pease. Albany.



# PLATE 91.

Page

Fig. 1, 2, 3. ORTHIS MUSCULOSA. 409

1 *a*, *b*. Dorsal and ventral views of a cast of a small individual.

2 *a*. Ventral view of a larger individual, with a small muscular impression.

2 *b*, *c*. Cardinal and dorsal views of the preceding, showing the cavities made by the brachial lamellæ and cardinal process, and the impression of the longitudinal crest.

3. The ventral side of a cast with narrow and small muscular impressions (perhaps a distinct species).

3 *a*. The cast of a specimen preserving a large and strongly marked muscular impression.

3 *b*. A mould from the cast shown in the preceding figure. (The imprints of the adductor muscles are omitted in the drawing.)

3 *c*, *d*, *e*. Dorsal, profile and cardinal views of the same specimen.

Fig. 4 & 5. ORTHIS HIPPARIONYX. 407

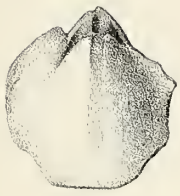
4. The cardinal area, showing the closed foramen.

5. A portion of the surface of a young shell enlarged, showing the character and direction of the striæ.

# ORISKANY SANDSTONE

(BRACHIOPODA)

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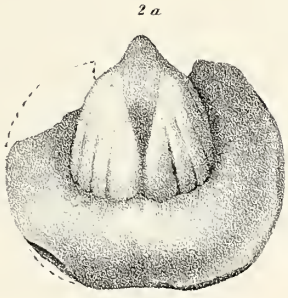
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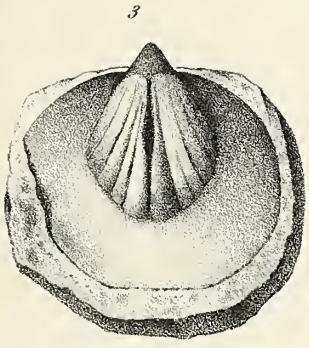
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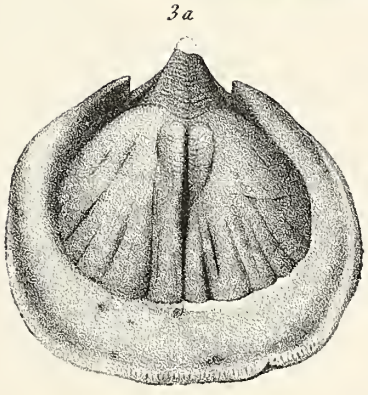
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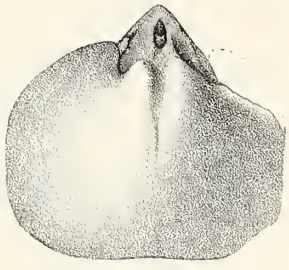
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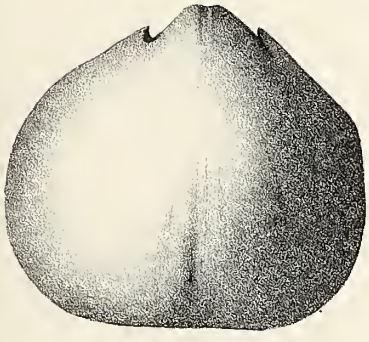
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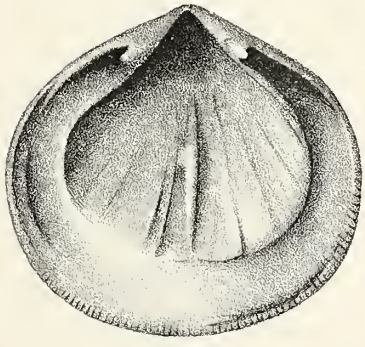
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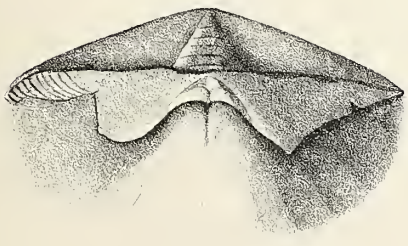

4

3 e

F.B Meek, del.

R.H.Pease Lith. Albany

# PLATE 92.

Page

Fig. 1 *a* – *d*. DISCINA GRANDIS. 406

1 *a*. The dorsal valve, from a cast taken from the mould of the original in sandstone.

1 *b*. The ventral valve from the inside, the shell having been mostly removed by weathering.

1 *c*. Profile of the dorsal valve.

1 *d*. The ventral valve, from a cast retaining the two valves in connexion. The foramen, as seen in this specimen, extends more nearly to the margin than is shown in fig. 1 *b*, which is seen from the inside.

Fig. 2 & 3. STROPHODONTA MAGNIVENTRA. 411

2 *a*. The cast of the interior of a ventral valve, where the muscular impression is very strongly marked, and occupies a large part of the area of the valve. The central upper portion, marked by the adductor muscles, is, in this and some other specimens, well defined and separated from the other parts.

2 *b*. A similar cast, where the cardinal angles are more extended and the muscular impressions less strongly defined. Both this and the preceding specimen show the imprint of the strongly striated cardinal area; the first one having a flattened space without striæ in the place of the foramen, while this feature is less distinctly seen in the latter.

2 *c*. A fragment of a similar specimen, showing a process extending into the cavity towards the beak of the valve. A mould made from the casts of this species shows the foramen to be entirely closed, with a thickened process below and a cavity extending beneath it towards the beak; as if there may have been, at some period of growth, a perforation of the apex.

3. The exterior of the ventral valve, showing the strongly striated surface.

Fig. 4. STROPHODONTA VASCULARIA. 412

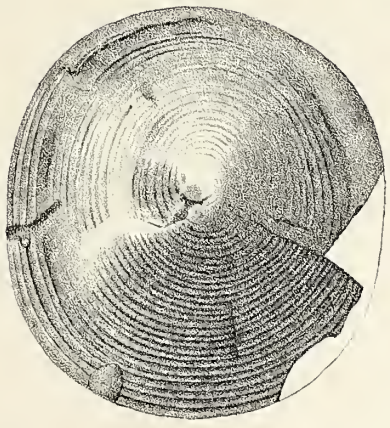
4. A cast of the ventral valve. (The muscular and vascular markings are not correctly represented in the figure.)

# ORISKANY SANDSTONE

(BRACHIOPODA)



1a



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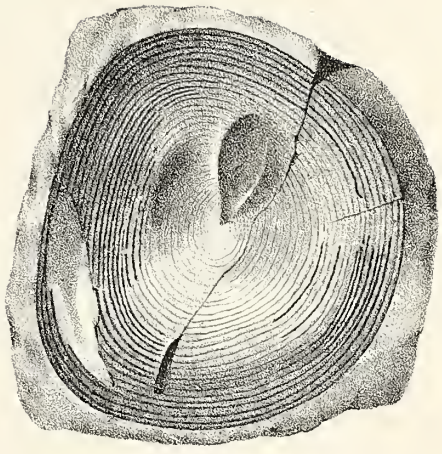

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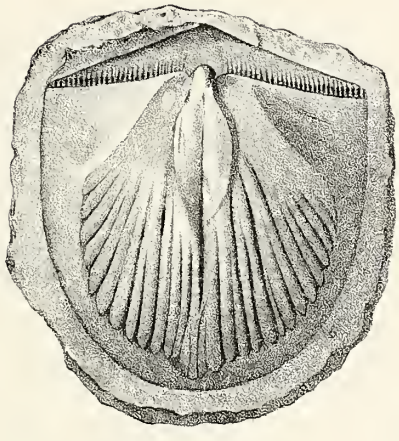

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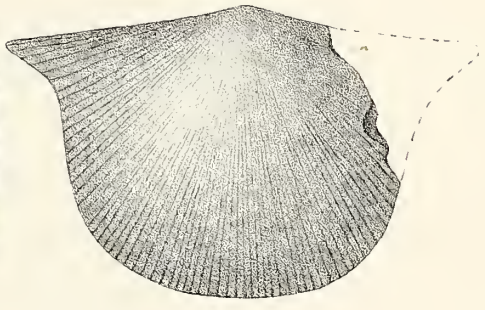

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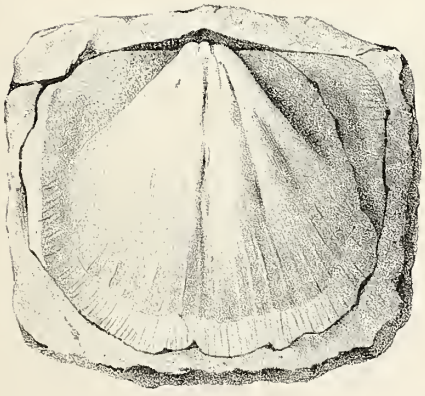

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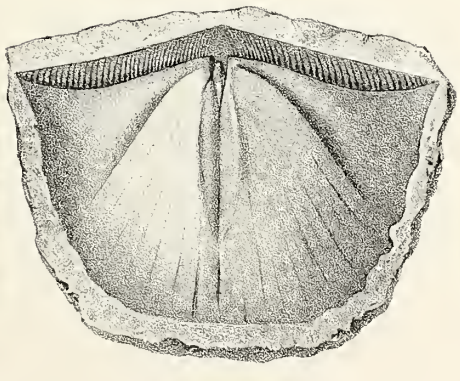

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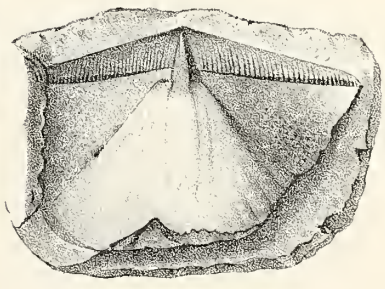


F.B.Meek, del.

Rich.d H.Pease, Lith. Albany.

# PLATE 93.

Page

Fig. 1 *a* – *d*. CHONETES COMPLANATA. 418

1 *a*. An impression of the outside of the ventral valve of this species.

1 *b*. A similar impression in sandstone, showing the concentric lines of growth.

1 *c*. A cast of the interior of a ventral valve, showing the muscular impression and cavities of the dental lamellæ.

2 *c* (in centre of plate, by error for 1 *d*). An enlargement of the imprint of the surface, as sometimes seen in sandstone.

Fig. 2 *a*, & 3 *a*, *b*. STROPHODONTA LINCKLÆNI. 415

2 *a* (the specimen referred with doubt to this species). The exterior of a ventral valve, in which the shell is partially exfoliated.

3 *a*. The imprint made by the interior of the dorsal valve of a small individual, showing the cavities made by the bifurcating cardinal process, the impressions of the median crest, and the low ridges towards the centre of the shell.

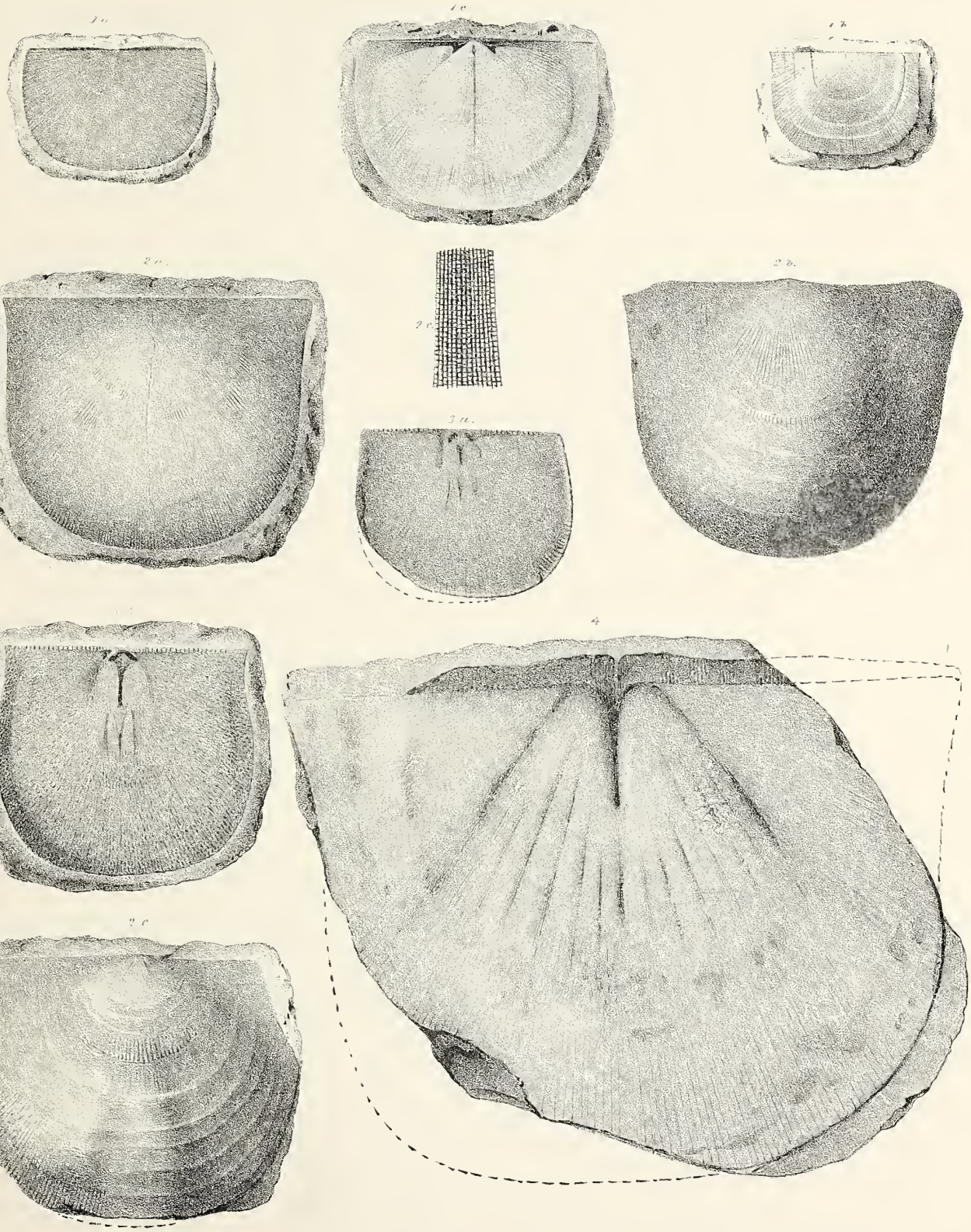
3 *b*. The impression of a larger ventral valve of this species, showing the same features as the preceding, the crenulated hinge-line, and the abruptly recurved outer margin.

Fig. 2 *b*, *c*? STROPHODONTA VASCULARIA. 412

2 *b*, *c* are referred to this species with some hesitation ; they are the impressions of the exterior of the dorsal valve, and show the convexity corresponding to the concavity of the shell, which only occurs in an equal degree in this or the preceding species; the others in the rock being much less concave on the dorsal side.

Fig. 4. STROPHODONTA MAGNIFICA. 414

4. The cast of a ventral valve, preserving the marks of the muscular impression and the imprints of the radiating striæ.



F. B. Meek del

Hoffman-Knickerbocker Lith. Co. N.Y.

# PLATE 94.

Page

Fig. 1 *a* – *d*. LEPTÆNA? NUCLEATA. 419

1 *a*, *b*. Ventral and profile views of the east.

1 *c*. Cardinal view.

1 *d*. Profile view enlarged.

Fig. 2 *a* – *d*. STROPHODONTA MAGNIFICA. 414

2 *a*. The impression of the dorsal valve of this speeies in sandstone. The eavities of the cardinal process are not shown in the figure.

2 *b*. A east taken from a similar mould, showing the diverging divisions of the eardinal proeess, erenulated hinge-line, muscular impressions, ete. ( The details of the marking are not well shown in this figure.)

2 *c*, *d*. The impressions of the same in sandstone, the marking being preserved in different degrees of perfeetion in the two speeimens.

Fig. 2 *e*, *f*, & 3. STROPHOMENA RUGOSA, *var.* VENTRICOSA. 417

2 *e*. A east taken from the impression of a dorsal valve in sandstone.

2 *f*. An impression of the dorsal valve in sandstone.

3. A cast in sandstone of the ventral valve. The speeimen has been weathered, and the parts are not so salient as they otherwise would be : the hinge-line is obliterated in the speeimen.

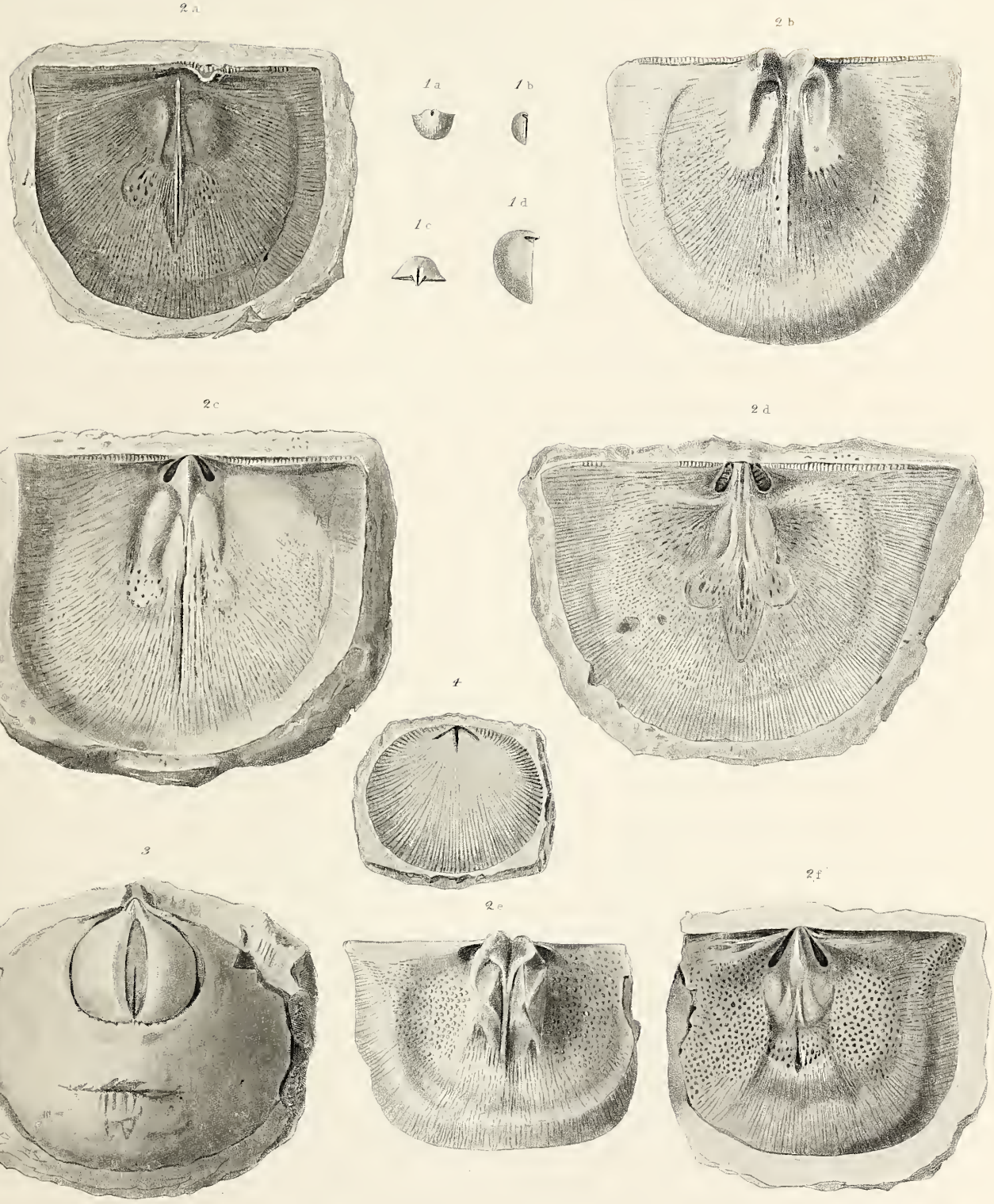
Fig. 4. ORTHIS HIPPARIONYX. 407

4. The cast of the dorsal valve of a young shell of this species.

# ORISKANY SANDSTONE.



(BRACHIDPODA)






Engraved & Printed by J.E.Gavit

# PLATE 95.

Page

Fig. 1 – 7. ORTHIS MUSCULOSA. 409

1. Dorsal view of a specimen preserving the shell. The striæ are partially obliterated by the silicification of the shell, and they are not sufficiently curved towards the hinge-line in the figure.
2. Profile view of the same specimen.
3 & 4. Dorsal and ventral views of a smaller specimen.
5. Interior of the ventral valve.
6. Interior of the dorsal valve.
7. Cardinal view of the dorsal valve, showing the outline and the elevation of the processes.

Fig. 8. STROPHODONTA MAGNIFICA. 414

8. A cast of the ventral valve, showing the muscular impression in part, with the shell preserved upon the lower part of the specimen.

Fig. 9. STROPHODONTA MAGNIVENTRA. 411

9. This figure is an impression taken from a mould in sandstone, left by the solution and removal of the shell. The broad reniform muscular impressions are strongly defined by an elevated rim; and between these and the median crest there are, on each side, other equally marked impressions, which, with the flattened median crest, appear to have been the points of attachment for the adductor muscles. Below and outside of these are vascular impressions approaching those of PRODUCTUS, which are strongly marked, but not limited as the others.

Fig. 10. STROPHODONTA VASCULARIA. 412

10. A cast of the dorsal valve from an impression in sandstone. The divisions of the cardinal process are not of the full length, owing to the cavities not becoming filled with the material forming the cast.

# DRISKANY SANDSTONE.

(BRACHIOPODA.)



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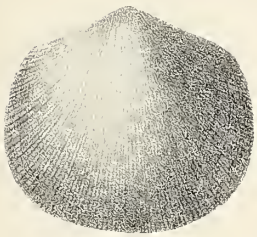

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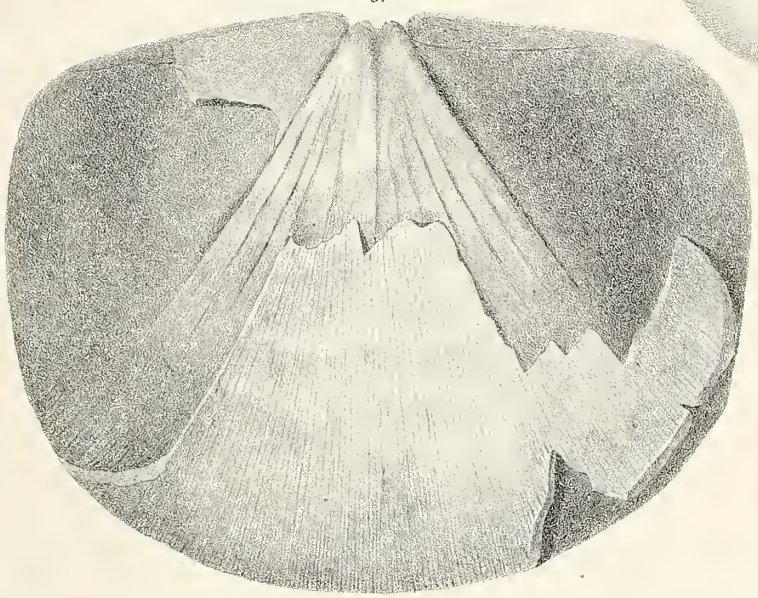

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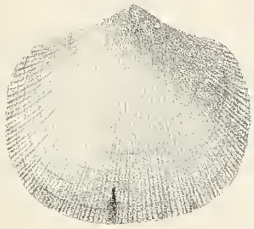

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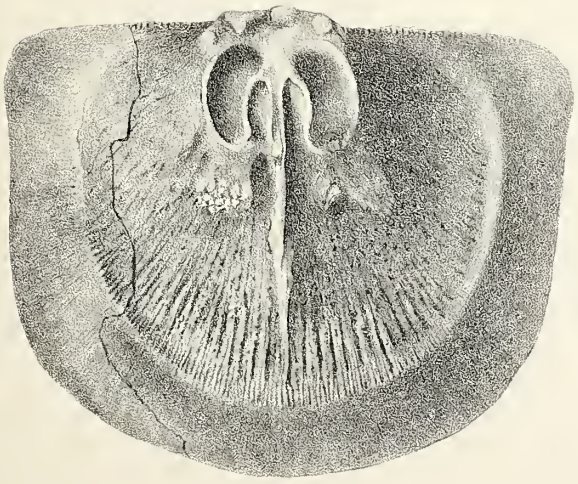

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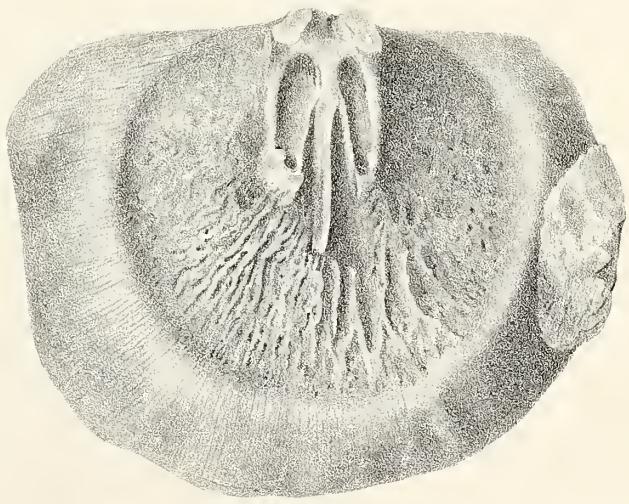

P. B. Meek del.

Lith. of Hoffman Pease & Tolley Albany

# PLATE 95 A.

Page

Fig. 1. RHYNCHOSPIRA RECTIROSTRA. 485

1 *a*, *b*, *c*. Dorsal, ventral and profile views of a specimen of this species.

Fig. 2, 3, 5 & 6. MERISTA (CAMARIUM) TYPUM. 487

2 *a*. Dorsal view of a specimen of this species.
2 *b*. Profile view of the same.
3. Interior of the ventral valve, showing the transverse arching septum.
5. A longitudinal section of fig. 3.
6. A cast of the interior of a valve similar to fig. 3.

Fig. 4. MERISTA (CAMARIUM) ELONGATUM. 488

4. The interior of a ventral valve of this species: the sides of the valve, and a part of the arching septum, have been broken away.

Fig. 7 – 11. RHYNCHOSPIRA FORMOSA. 485

7. Interior of the ventral valve of a specimen of this species.
8. Interior of the dorsal valve, enlarged to two diameters, to show the broad cardinal process which covers the extremities of the beak, and, when the valves are closed, passes beneath the deltidial area of the opposite valve. The bases of the crura are shown on each side at the base of the cardinal process, and the short median septum also is shown.
9. Profile view of the same, showing the cardinal and crural processes.
10. The upper part of the two valves connected in their natural relations to each other, and showing the manner of articulation.
11. A longitudinal section, showing the foramen, the deltidium, and the cardinal process of the opposite valve lying beneath it; the crura first bending downwards, and then re-curved into the dorsal valve and continued in the spire, with the descending process *e*, which forms, with the opposite one, a connecting filament between the two spires.

Fig. 13 & 14. STROPHODONTA INTERMEDIA*. 482

13. The exterior of the dorsal valve.
14. The interior of the same.

Fig. 15 – 19. STROPHODONTA MAGNIFICA†. 482

15. A dorsal view, showing the area, which is imperforate and striate. The specimen is below the medium size which this shell usually attains.
16. Ventral view of the same: the margins are broken, and the outline is consequently imperfect.
17. The interior of a ventral valve of the same species, showing a central pit or foramen.
18. View of the area when the linear foramen is closed.
19. Enlargement of the striæ, showing their mode of bifurcation, and the puncta which are very regularly interposed between the striæ.

Fig. 20 & 21. ORTHIS CUMBERLANDIA. 481

20. The exterior of a ventral valve of this species.
21. The interior of a smaller ventral valve of the same.

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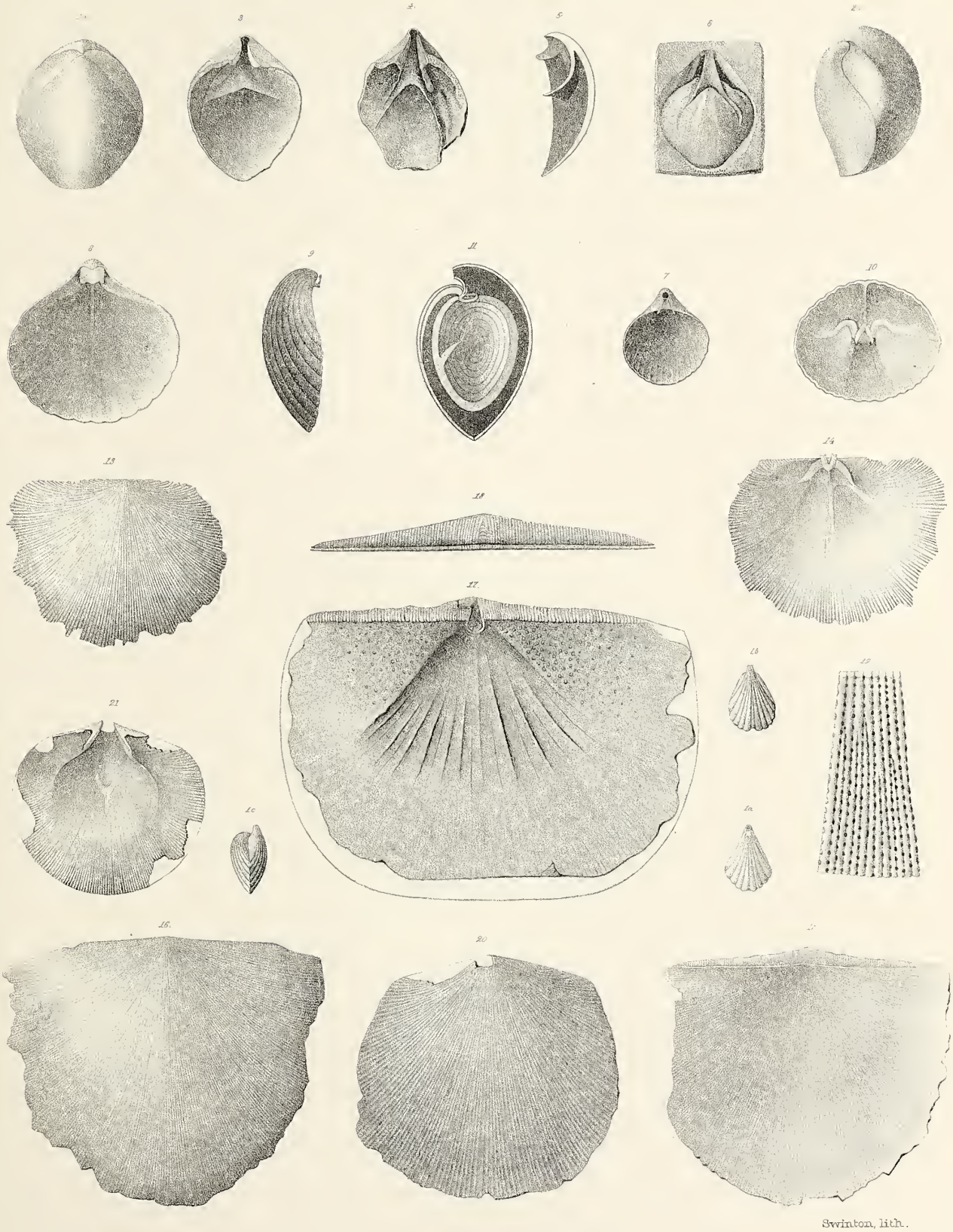
* This species possesses the cardinal process of STROPHODONTA, with the dental lamellæ of STREPTORHYNCHUS.

† This species may be compared with *Orthis hipparionyx*, page 407. The striæ, however, are more sharply elevated and less curved towards the hinge-line, while the muscular impression is not distinctly bilobate as in that species.

# LOWER HELDERBERG GROUP.
# & ORISKANY SANDSTONE.

(BRACHIOPODA.)





Swinton, lith.

# PLATE 96.

Page

Fig. 1 – 6. CYRTIA ROSTRATA. 429

1 *a*, *b*. Dorsal and cardinal views of a young specimen, which has six plications on each side of the mesial fold.

2 *a*, *b*. Dorsal and front views of a larger specimen.

2 *c*, *d*. Profile and cardinal views of the same specimen.

3 *a*, *b*. Cardinal and front views of another individual, with a higher area and less extended hinge-line. The beak in fig. 3 *a*, as represented, is not sufficiently elevated.

4 *a*, *b*. Ventral and dorsal valve of an old specimen.

4 *c*, *d*. Profile and cardinal views of the same specimen.

5. Interior of the dorsal valve.

6 *a*, *b*. The exterior and interior of a dorsal valve of this species.

Fig. 7 *a* – *f*. SPIRIFER SUBMUCRONATUS. 419

7 *a*, *b*. Ventral and dorsal views of a specimen of this species.

7 *c*. A specimen with one of the cardinal angles more extended.

7 *d*. Front view of the preceding.

7 *e*. Profile view of a specimen of this species.

7 *f*. The interior of the ventral valve.

Fig. 8 *a* – *e*. SPIRIFER TRIBULIS. 420

8 *a*, *b*. Ventral and dorsal views of a specimen of ordinary size.

8 *c*. Front view of a specimen which is less gibbous than usual.

8 *d*. Profile view of a more gibbous specimen. (The dorsal valve is represented as too convex.)

8 *e*. An enlargement of the surface, showing the fine concentric and radiating striæ.

Fig. 9 *a* – *h*. SPIRIFER CUMBERLANDIÆ. 421

9 *a*, *b*. Dorsal and ventral views of a large individual, showing the foramen almost entirely closed.

9 *c*. Front view of another individual.

9 *d*. Profile view of the specimen.

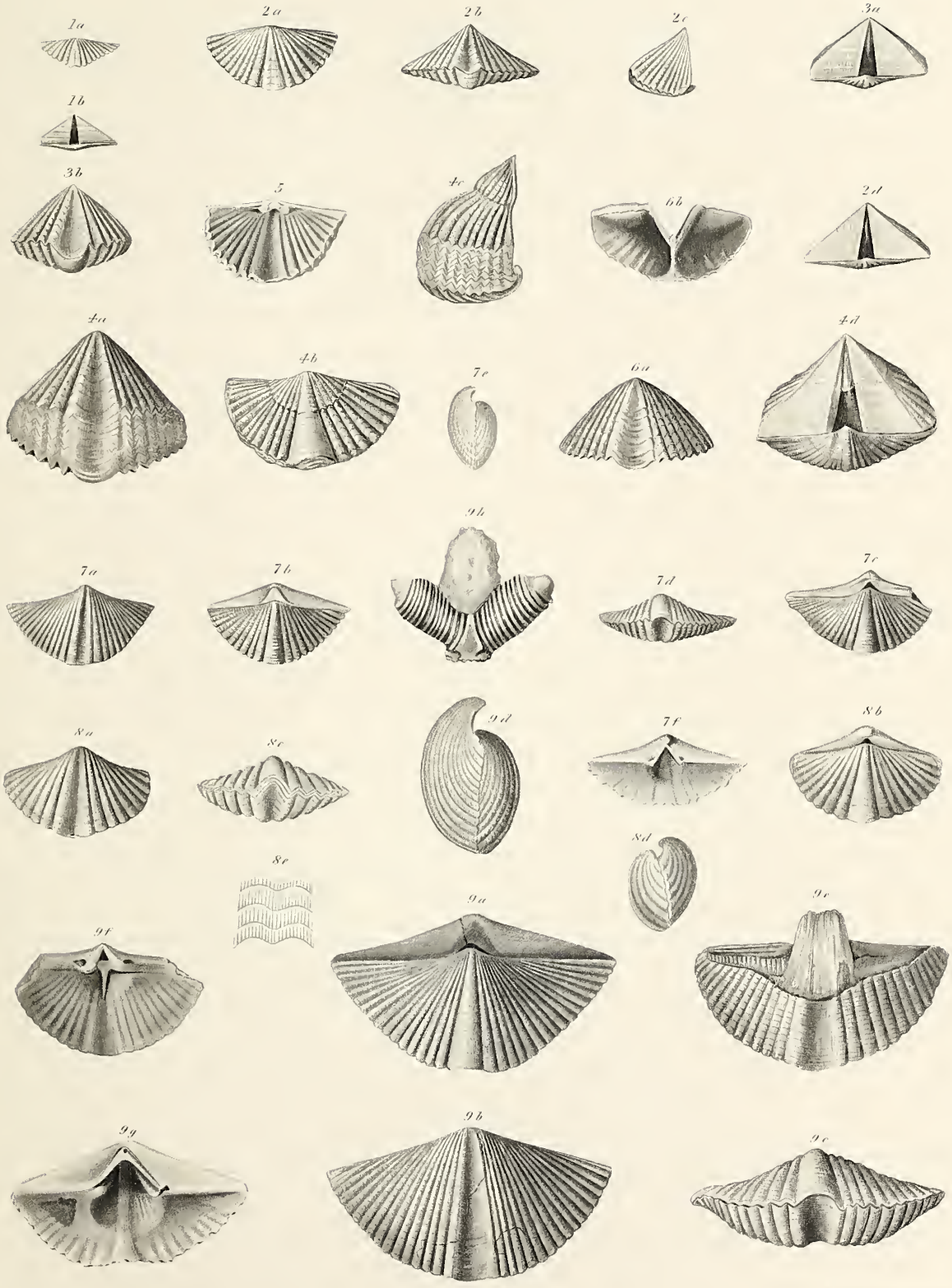
9 *e*. Ventral view of a specimen from the upper part of which the shell is removed, showing the cast of the muscular area and the rostral cavity.

9 *f*. Interior of the dorsal valve, showing the cardinal and crural processes, with the dental fossets.

9 *g*. Interior of the ventral valve, showing the partial closing of the foramen, with a perforation at the summit, the dental lamellæ, etc.

9 *h*. View of a cast of the internal spiral appendage, probably of this species.

(BRACHIOPODA)




F. B. Meek, Del.

# PLATE 97.

Page

Fig. 1 *a* – *h*, & 2 *a* – *i*. SPIRIFER ARRECTUS. 422

1 *a*. *b*. Dorsal and front views of a specimen in which the shell is partially exfoliated. (The mesial fold is more angular in the specimen than is represented in the figure.)

1 *c*. The ventral valve of another specimen, in which the plications are rounded.

1 *e*. A ventral valve which is more extended on the hinge-line, and preserves to a considerable degree the surface markings, and has about eight plications on each side.

1 *f*. A dorsal valve of proportionally greater length : the plications are broad and rounded, and seven are visible on each side.

1 *g*. Profile view of a gibbous specimen.

1 *h*. An enlargement of the surface, showing the fine concentric and radiating striæ as they appear on a worn surface.

2 *a*. The dorsal side of a cast, in which the plications are sharply angular.

2 *b*, *c*, *d*, *e*. Casts of the ventral valve, showing a variety of form and markings in the cast of the muscular impression, and in the number and development of the plications.

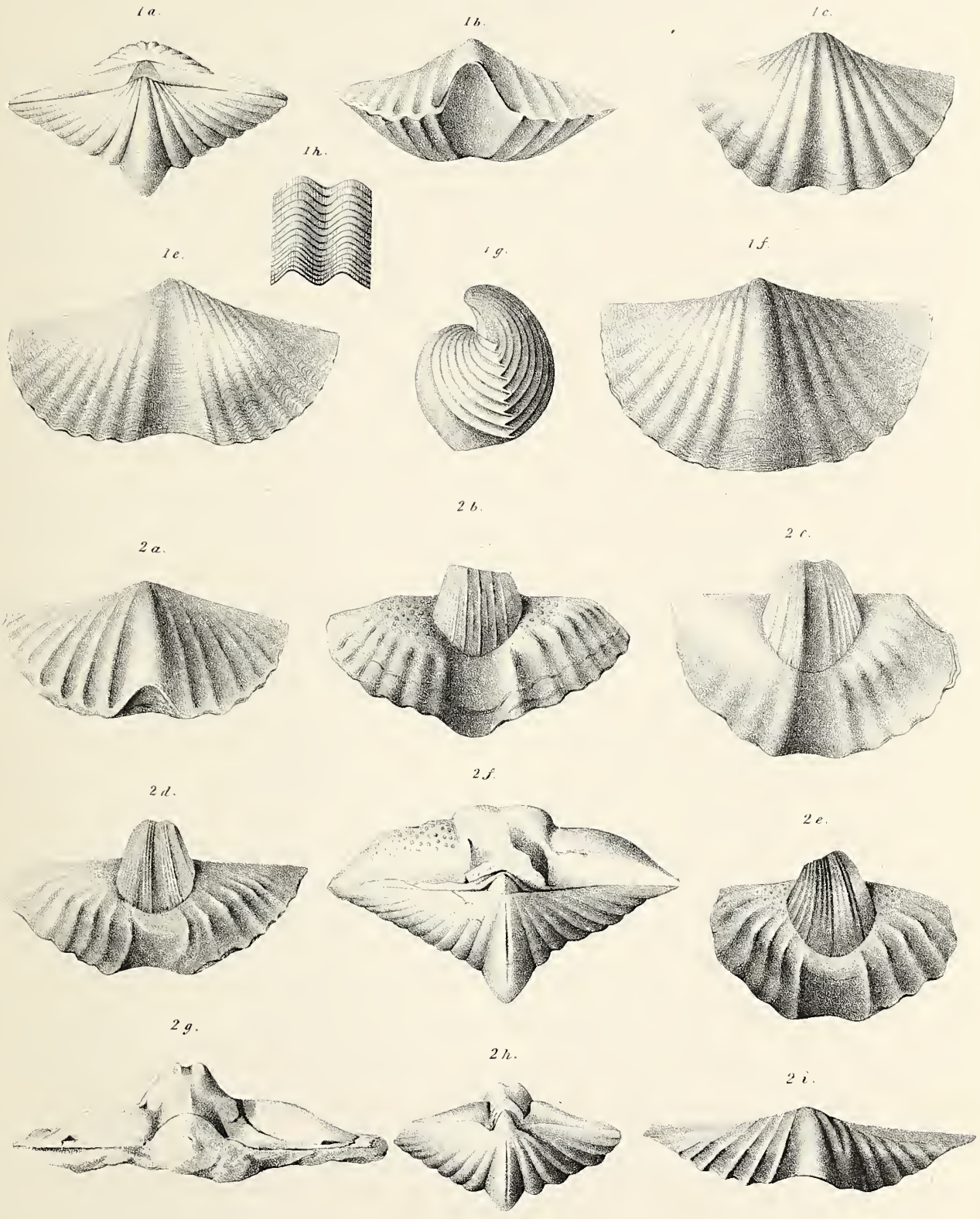
2 *f*. Cardinal view of a cast which is somewhat distorted, and shows a part of the ventral valve : the beak is broken off.

2 *g*. A cardinal view of the cast of a ventral valve, showing the elevation of the process filling the beak.

2 *h*. A similar view, showing also the ventral side and the median line.

2 *i*. The cast of a distorted specimen.

BRACHIOPODA

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Lith. of R.H. Pease, Albany

# PLATE 98.

Page

Fig. 1 – 8. SPIRIFER ARENOSUS. 425

1 & 2. Two views from the same specimen, which is slightly distorted and the shell partially removed.

3. Ventral valve of a large specimen.

4. A dorsal view, showing the area and foramen.

5. View of a ventral valve.

6. The dorsal side of a specimen where the shell is worn from the mesial fold, and partially from the sides of the valve.

6 *a*, *b*. Front and profile views of the same specimen, the ventral side being a cast of the interior.

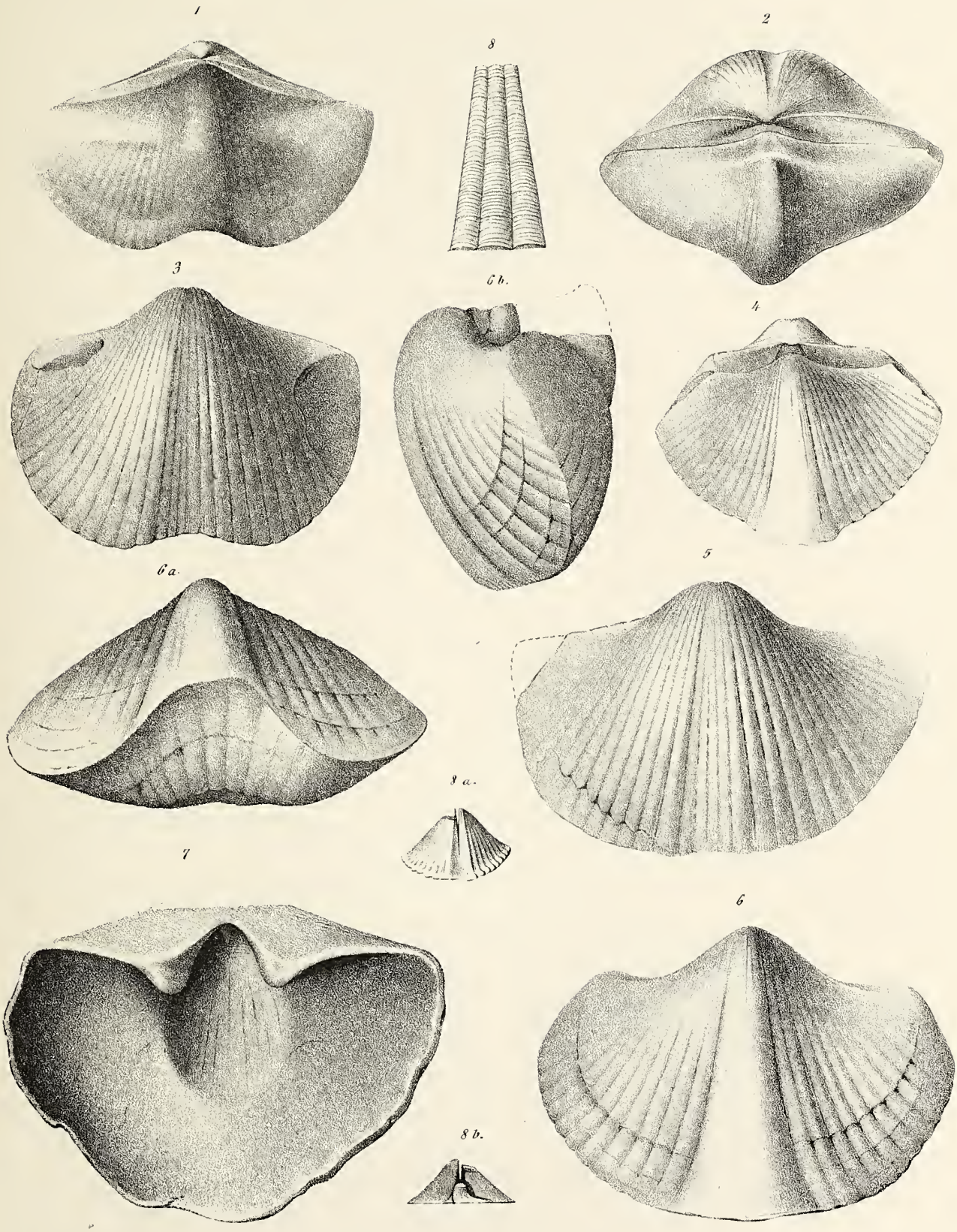
7. The interior of a large ventral valve.

8. Enlargement of the plications, showing fine concentric striæ.

Fig. 8 *a*, *b*. CYRTIA ROSTRATA. 429

8 *a*, *b*. Ventral and cardinal view of an imperfect cast of this species.

BRACHIOPODA



# PLATE 99.

Page

Fig. 1 – 10. SPIRIFER ARENOSUS. 425

1, 2 & 3. Casts of the dorsal valve of young and medium-sized specimens.

4 & 5. Casts of larger individuals, showing the marks of the muscular impressions.

6 *a*. A specimen below the medium size, in which the marks of the muscular impression are well preserved, the transverse striæ being as distinct as in older shells.

6 *b*. Cardinal view of the same specimen.

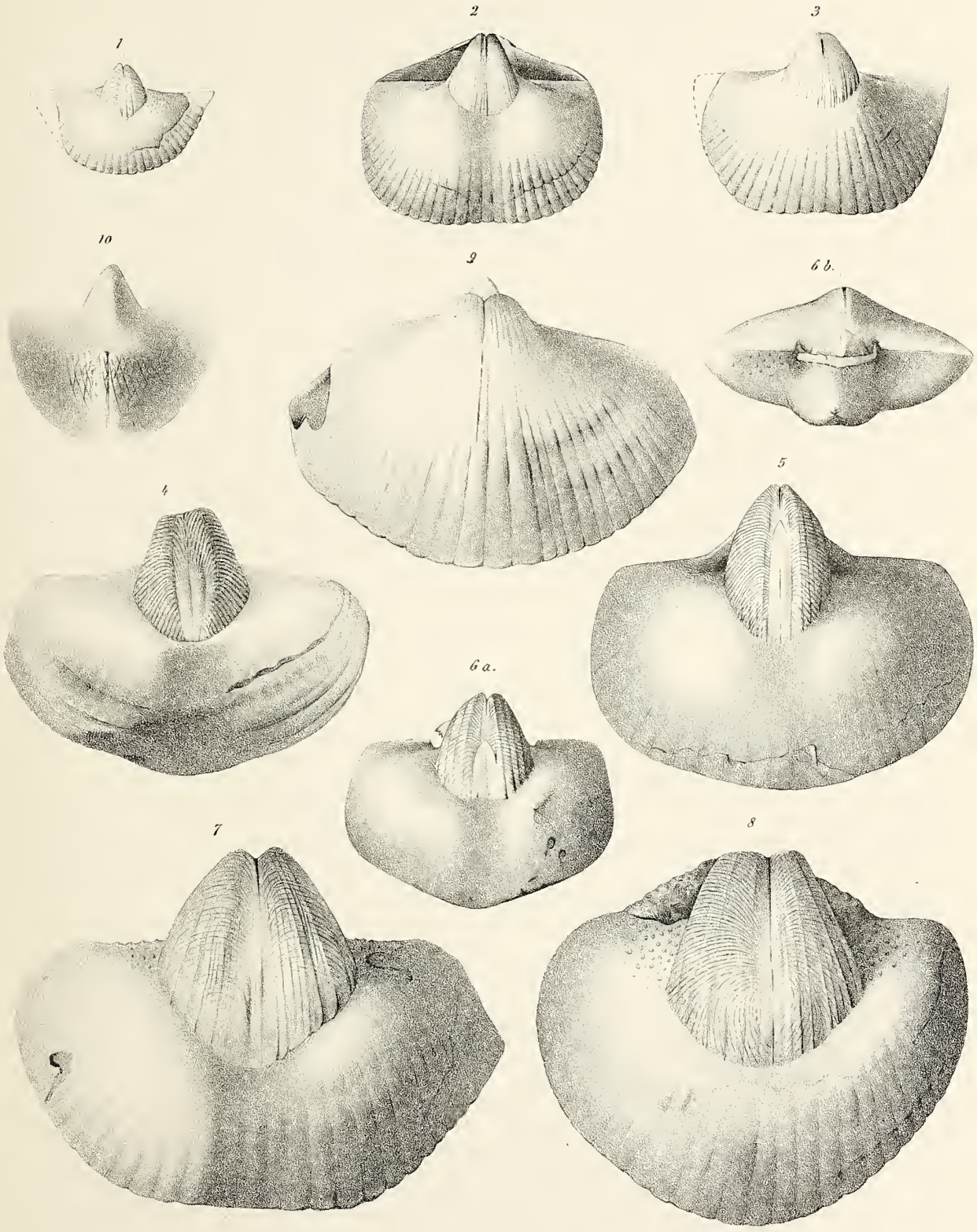
7 & 8. Casts of the ventral valve of very old specimens.

9 & 10. Casts of the dorsal valve, the latter figure presenting an unusual extension of the beak.

# ORISKANY SANDSTONE.



BRACHIOPODA



# PLATE 106.

Page

Fig. 1 – 8. SPIRIFER ARENOSUS. 425

1 *a*, *b*. Dorsal and ventral views of a very young specimen, showing the characters already described.

2. A larger specimen.

3 *a*, *b*. Dorsal and ventral views of a larger specimen, showing the commencement of the dichotomizing of the plications of the mesial fold and sinus.

4 *a*, *b*. Dorsal and ventral views of a specimen of medium size, in which the cardinal angles are a little produced.

4 *c*. Profile view of the same specimen.

4 *d*. Cardinal view of the same.

4 *e*. Front view of the same.

5. The interior of a dorsal valve.

6. The interior of a ventral valve, with an area of medium width, and a slight thickening on each side of the muscular impression.

7. An old shell having the foramen partially closed by a callosity, and an excessive thickening of the shell on the inside. The inner laminæ of the shell are much broken away.

8 *a*. The exterior of the ventral valve of a large individual, which preserves the external markings in a good degree of perfection.

8 *b*. The interior of the same, showing the large area, partially closed foramen, and dental lamellæ, while the inner lamina of the shell around the muscular impression is exfoliated.

Fig. 9 – 12. SPIRIFER PYXIDATUS. 428

9 *a*. Dorsal view of a specimen of this species.

9 *b*. Ventral view of the same.

9 *c*, *d*. Profile and front views of the same.

10. The interior of the ventral valve, showing the area, etc.

12. A cast of the dorsal valve.

# ORISKANY SAND STONE.

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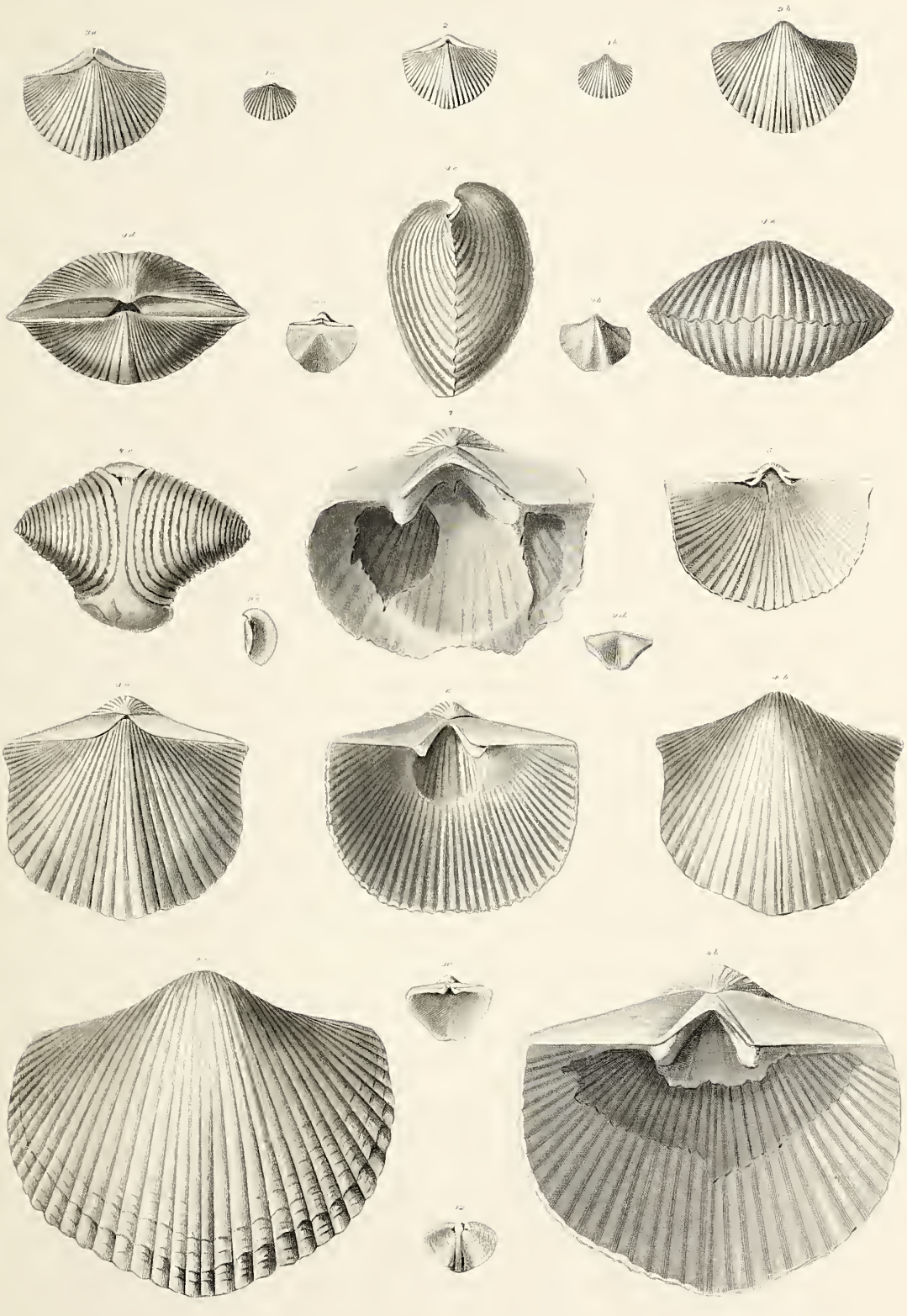


John P. Gray del. Alb.

# PLATE 101.

Page

Fig. 1. EATONIA PUMILA. 437

1. The cast of the ventral valve, natural size.

Fig. 2 *a* – *g*. EATONIA PECULIARIS. 436

2 *a*, *b*, *c*. Dorsal, ventral, and profile views of a specimen, having the ordinary form and proportions of this species in the Oriskany sandstone.

2 *d*. A cast of the dorsal valve of this species, showing the median septum and lateral lamellæ.

2 *e*. A cast of the ventral valve, showing the form of the muscular impression, the median septum, and the small points of attachment for the adductor muscles.

2 *f*. A specimen preserving a portion of the shell, which, on one side, is penetrated by the ramifying vessels. (The lamellose structure of the shell is confounded with the surface striæ in the figure, which gives it an unnatural appearance.) Figure enlarged to one and a half diameters.

2 *g*. A cast of the ventral valve, showing the muscular and vascular impressions (See corrected figure on Plate 61 A).

Fig. 3 *a* – *m*. MERISTA LATA. 431

3 *a*. Ventral valve of a young specimen.

3 *b*. Dorsal view of a large specimen.

3 *c*, *d*. *e*. Profile, ventral, and front views of the same specimen.

3 *f*. A ventral view of an intermediate form.

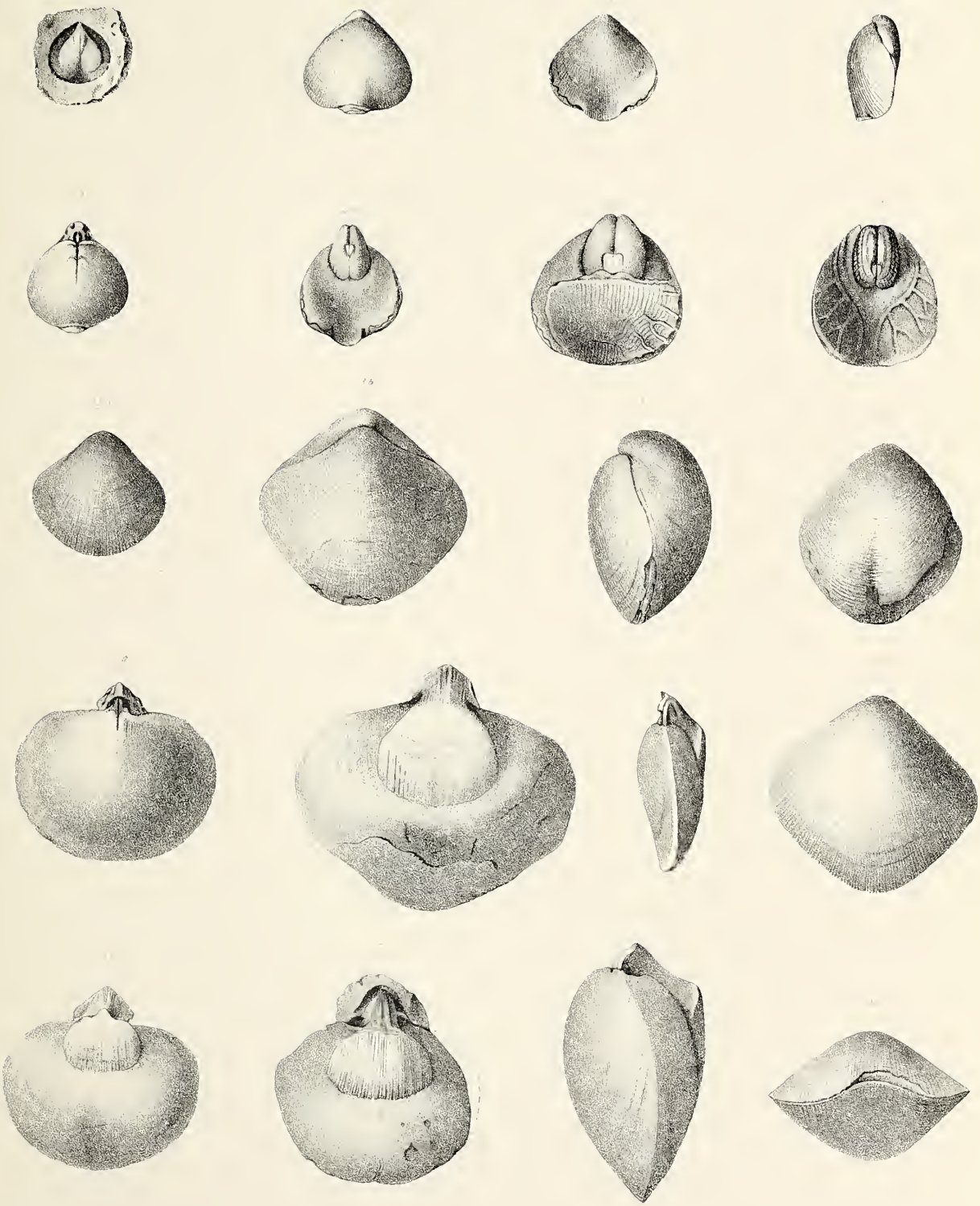
3 *g*. *h*. Dorsal and ventral views of a cast of this species. (The mark of the median septum is not shown in some of the figures.)

3 *i*. Profile view of the same.

3 *k*. Ventral view of an imperfect cast, showing a larger muscular area.

3 *l*. Ventral view of a large individual of this species.

3 *m*. Profile view of the same.



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# PLATE 101 A.

Page

Fig. 1 *a* – *h*. EATONIA PECULIARIS. 436

1 *a*. Interior of the ventral valve, showing the form of the muscular impressions, teeth, etc.

1 *b*. Profile of the same, showing the little elevations of the shell-surface, and the small pits for the adductor muscles *a* and the teeth *t*.

1 *c*. The dorsal valve, showing the crural processes and muscular impression.

1 *d*. Front view of the same, showing the deep sinus, and the relation of the crural processes and median septum.

1 *e*. Section of the dorsal valve, showing the elevation of the median septum and the crural processes.

1 *f*. Figure of the ventral valve (the inflected extension in front being removed) with a part of the dorsal valve attached, showing the crural processes, the median septum of the dorsal valve, the adductor imprints, the small oblique pits penetrating beneath the laminæ of the shell, and the cardinal muscular impression.

1 *g*. View of another specimen with the dorsal valve downwards and the ventral valve broken away, to show the median septum articulating with the bifurcating cardinal process of the dorsal valve.

1 *h*. A cast of the ventral valve, showing the muscular and vascular impressions. This and the preceding figure are enlarged to once and a half the natural size.

Fig. 2 *a*, *b*. EATONIA WHITFIELDI. 437

2 *a*. The exterior of the ventral valve.

2 *b*. The interior of the ventral valve, with the apex of the dorsal valve attached.

Fig. 3 – 6. EATONIA SINUATA. 438

3 *a*. Dorsal view of a large individual, which shows the prevailing form.

3 *b*, *c*. Profile and front views of the same.

4. Dorsal view of a more orbicular form.

5. Ventral view of a cast, showing the strong muscular impression with the small central adductor impression.

6. Ventral view of a cast preserving a part of the shell; the form of the shell and muscular impression more rotund than the preceding.

Fig. 7 & 8. RHYNCHONELLA RAMSAYI. 446

7. View of the dorsal side of the specimen.

8 *a*, *b*. Ventral and dorsal views of the cast of this species.

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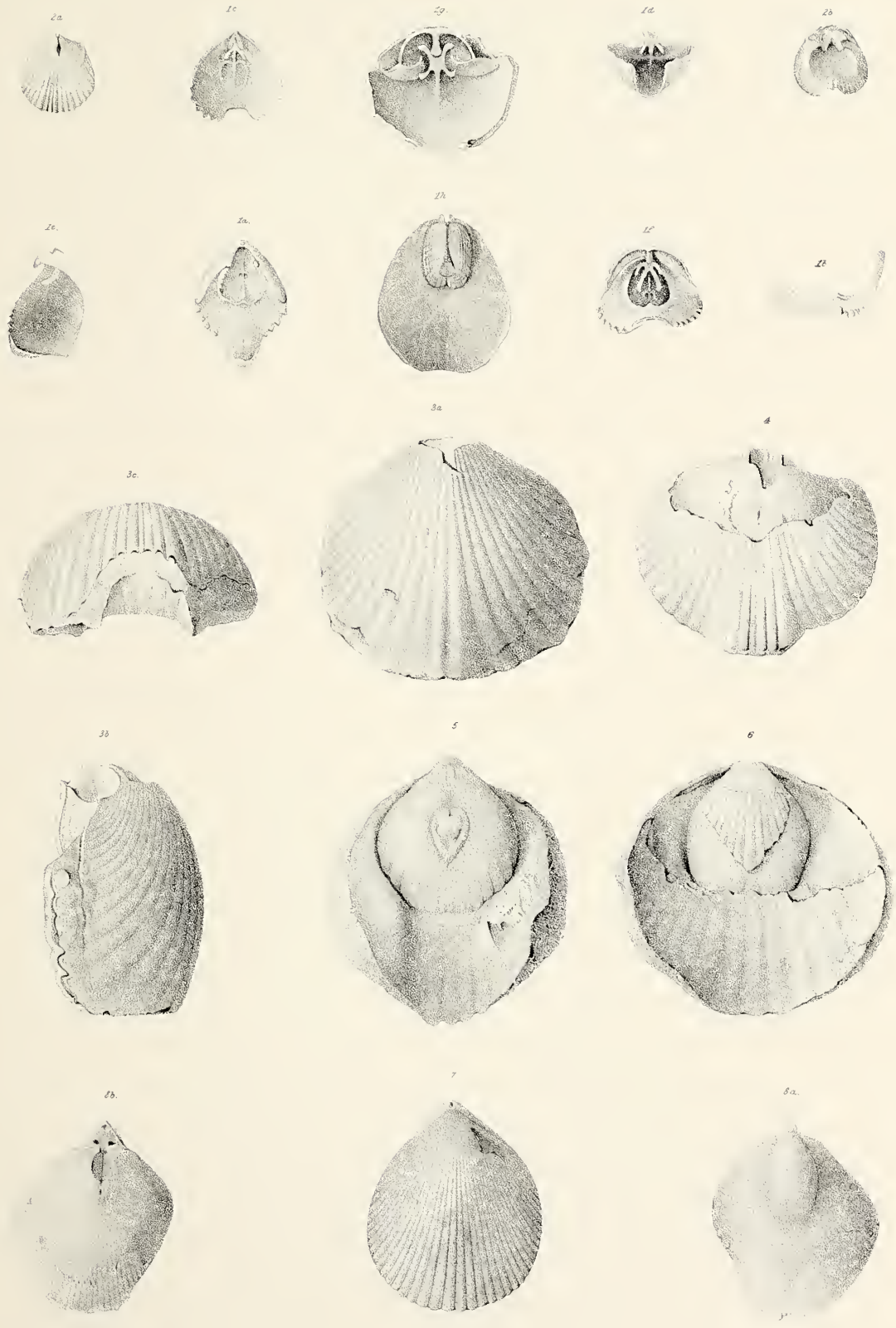


Swinton, lith.

# PLATE 102.

Page

Fig. 1 & 2. RHYNCHONELLA OBLATA. 439

1. A young individual, retaining a part of the shell on the dorsal valve.

2 *a*. Front view, showing the broad shallow sinus.

2 *b*. The ventral side of another specimen, showing the muscular area and the ramifying vascular impressions. (The latter are represented in lines too sharply defined : the two sides are not connected by a sharp line, as shown in the figure; and their extension towards the front of the shell is in shallow depressions, which gradually become obsolete.)

2 *c* & *d*. Dorsal and cardinal views of the same specimen.

Fig. 3. RHYNCHONELLA MULTISTRIATA. 440

3. View of the dorsal valve.

Fig. 3 *a*, *b*, *c*; 4 *a*, *b*, *c*. RHYNCHONELLA PLEIOPLEURA. 440

3 *a*. A ventral view of a cast. The area of the muscular impression is not sufficiently defined.

3 *b*. Dorsal view of the same specimen, showing a greater convexity of the valve, and a shorter medio-longitudinal septum than the *R. oblata*.

3 *c*. Front view of the same.

4 *a*. A larger individual. The specimen is somewhat broken and distorted.

4 *b* & *c*. Dorsal and profile views of the same.

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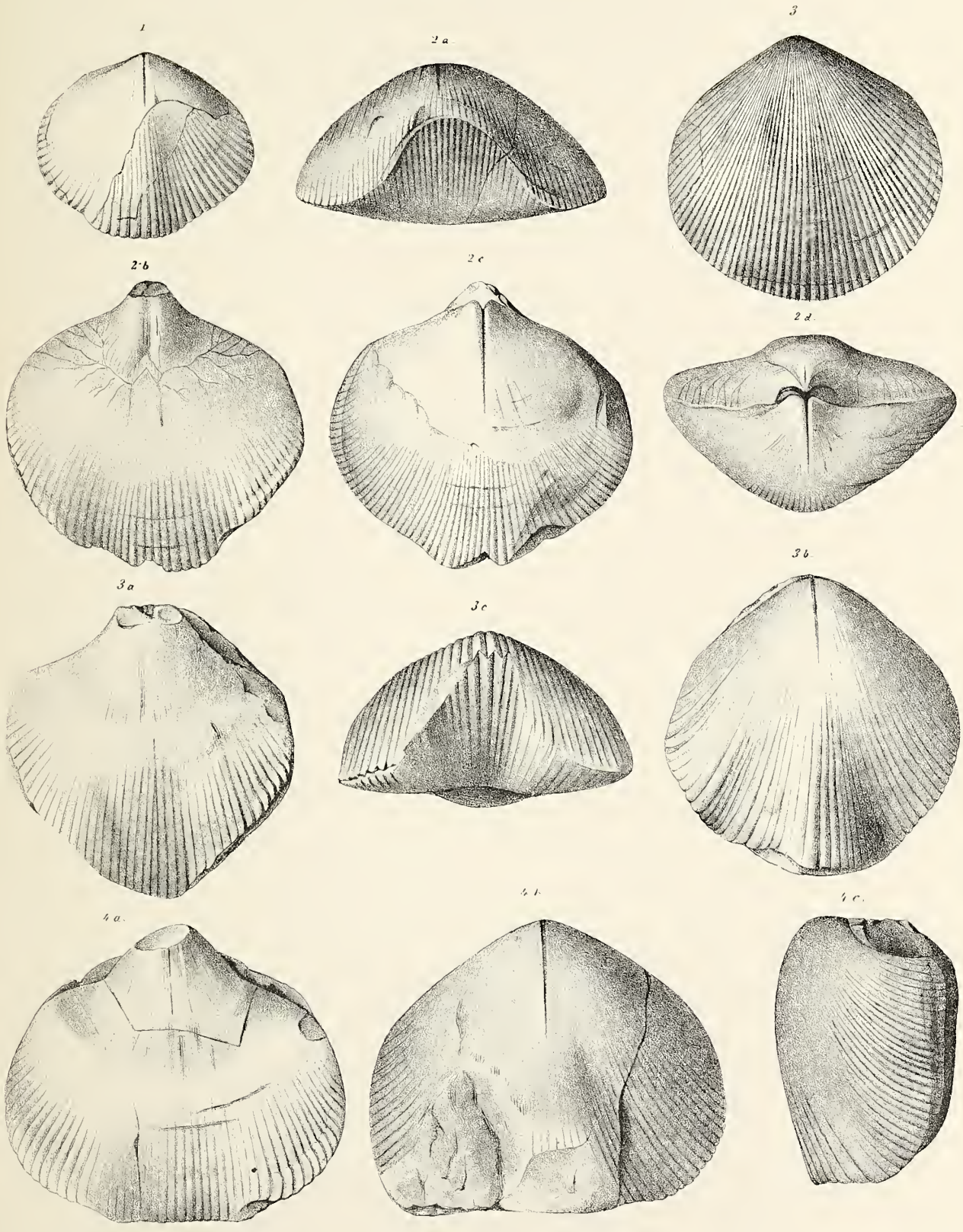


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# PLATE 103.

Page

Fig. 1. RHYNCHONELLA FITCHANA. 441

1 *a*. The dorsal side of the specimen, which preserves a part of the shell.

1 *b*. Profile view of the same.

Fig. 2. RHYNCHONELLA SEPTATA. 443

2. A cast of the dorsal valve, showing indistinct marks of a few plications near the margin.

Fig. 3 – 8. RHYNCHONELLA BARRANDI. 442

3. Cast of the ventral valve, showing the large muscular impression. The area of the adductor muscles is not represented as large as in the specimen. The depression in front is less than one-eighth of an inch below the plane of the more prominent margins.

4. A similar cast of a smaller individual, in which the form of the rostral cavity is better preserved than in the preceding. The casts show a great thickening of the shell at the beak.

5. Cardinal view of a specimen which is a cast from the interior of both valves, showing the great elevation of the dorsal valve, the strong median septum, and the deep sinuosity on each side of the beak.

6. Front view of the same specimen.

7. Lateral view of the same, showing the great lateral extension of the dorsal valve.

8. Profile view of a cast of the ventral valve, showing the abrupt inflection at the margin and the expansion of the shell below the beak, which fills the lateral sinuosities in the opposite valve.

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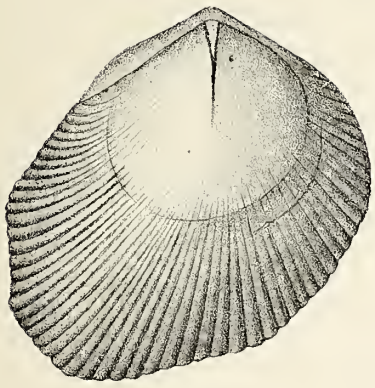

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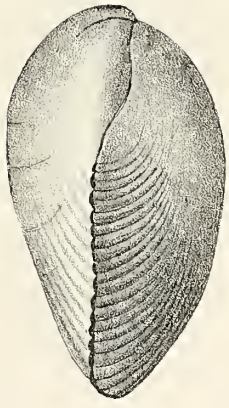

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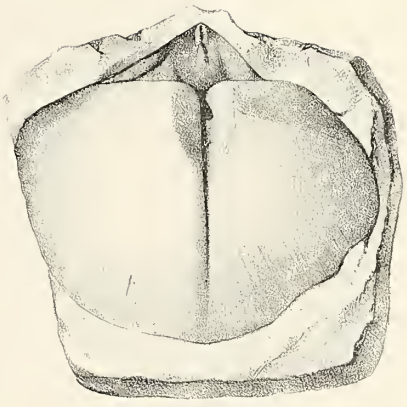

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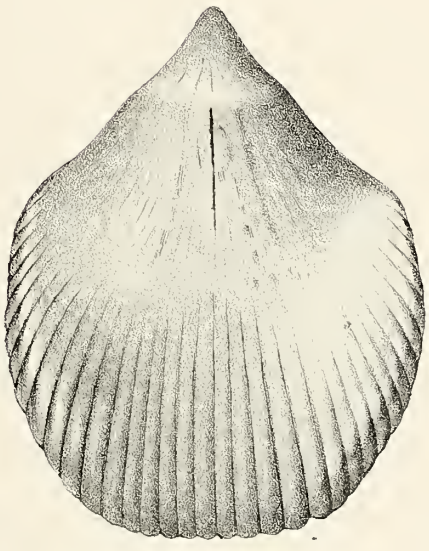

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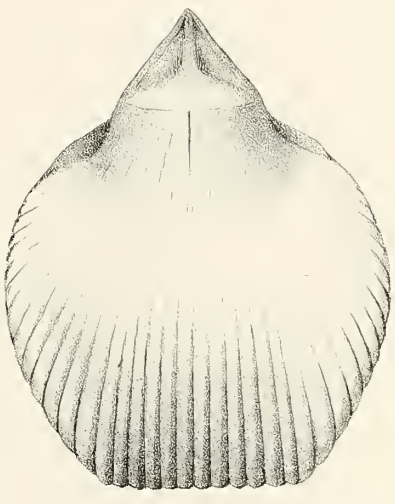

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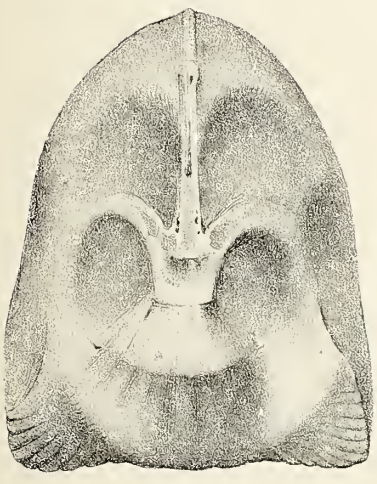

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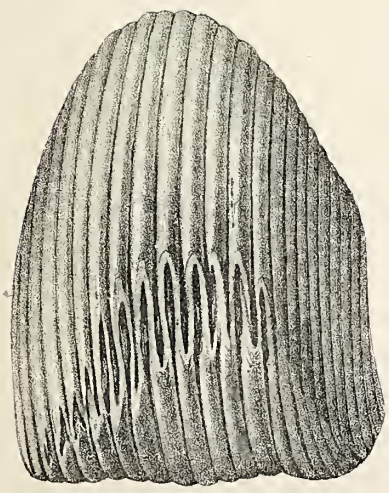

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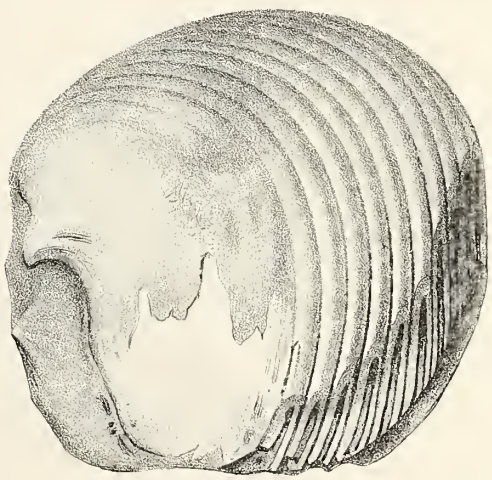

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# PLATE 103 A.

Page

Fig. 1 – 6. RHYNCHONELLA SPECIOSA. 444

1 *a*. Dorsal view of a specimen of medium size.

1 *b*. Profile of the same, showing some parasitic bodies attached at the front and side.

2 *a*. Dorsal view of a larger individual.

2 *b* & *c*. Profile and front views of the same.

2 *d*. Cardinal view, showing the deep sinuosities in the dorsal valve and the auricular extensions of the ventral valve.

3. A partial cast of a large individual of this species.

4 *a*. The ventral valve, showing the muscular impression : the teeth are broken off.

4 *b*. A fragment of a dorsal valve, showing the muscular impression, teeth, etc.

4 *c*. Cardinal view of the preceding specimen.

5. The rostral portion of a specimen, showing the junction of the valves, the median septum in the dorsal valve, and the crural processes of the ventral valve.

6 *a*. The interior of the dorsal valve, showing the median septum, the crural processes, the thickened cardinal process with the prominent bilobed summit, and the dental fossets.

6 *b*. Cardinal view of the preceding specimen, showing the sinuosities on each side of the beak, the cardinal and crural processes.

# ORISKANY SANDSTONE.



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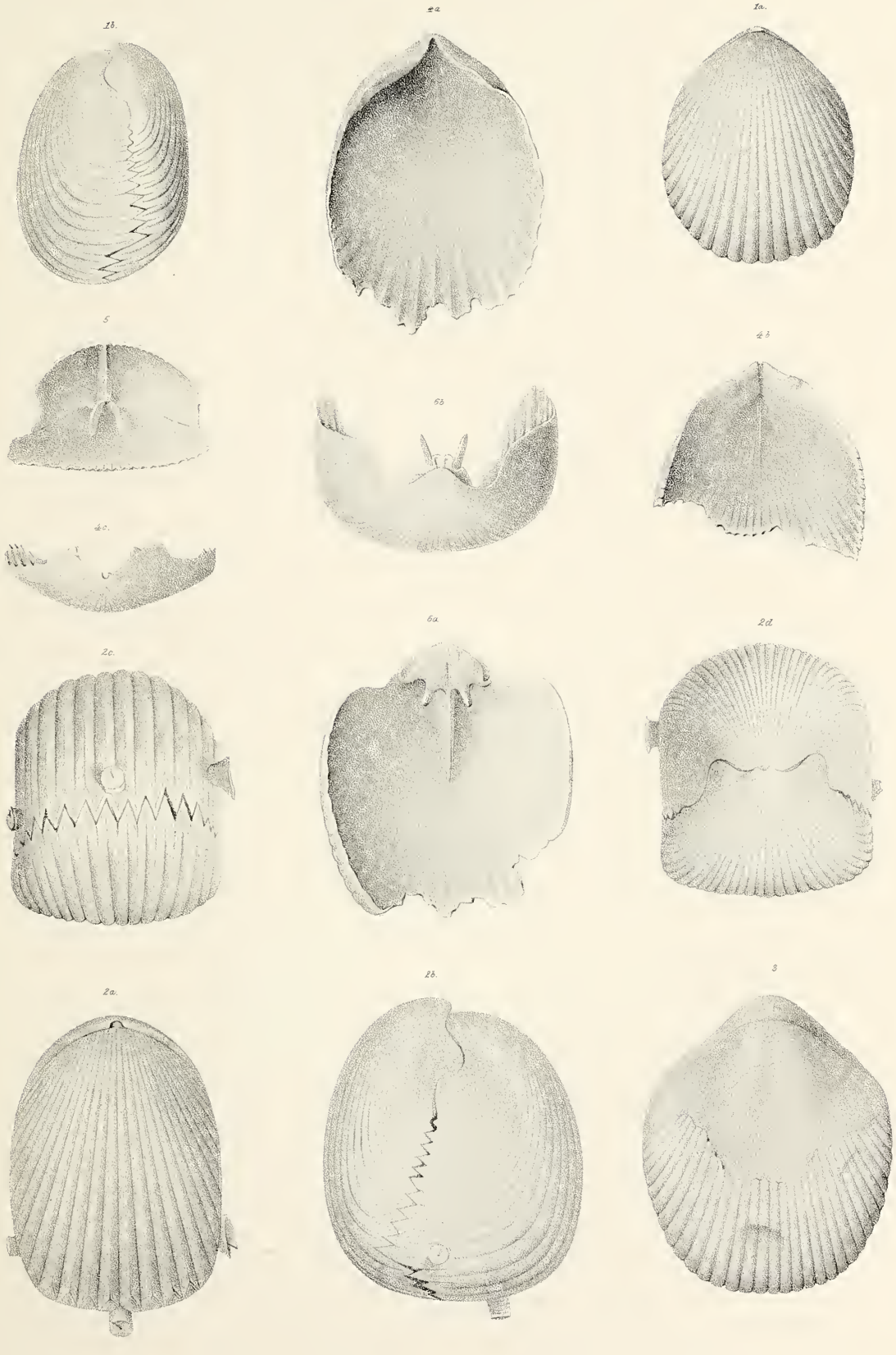


Swinton, lith

# PLATE 103 B.

Page

Fig. 1 *a* – *g*. LEPTOCŒLIA FLABELLITES. 449

1 *a*, *b*. Ventral and dorsal views of a specimen of this species.

1 *c*, *d*. Dorsal and profile views of a specimen of the ordinary form of this species.

1 *e*. Interior of a specimen with rounded extremities.

1 *f*. Interior of the dorsal valve of this species.

1 *g*. The interior of the dorsal valve, showing the cardinal process, crura and crural plate, restored from cavities seen in a cast.

Fig. 2 *a* – *g*. LEPTOCŒLIA FIMBRIATA. 450

2 *a*, *b*. Dorsal and ventral views of a specimen of ordinary size.

2 *c*. Front view of a specimen a little greater than the ordinary size, and which has the fimbriated expansion extending below the cardinal angles.

2 *d*. The ventral side of the preceding specimen, enlarged two diameters.

2 *d*+ & 2 *d*—. Dorsal and profile views enlarged the same as the preceding.

2 *e*. The interior of the ventral valve, showing the cardinal teeth and the muscular impression.

2 *e* (bis). The interior of the dorsal valve, showing the muscular impression, the cardinal process, the oblique lamella, median septum and bases of the crural processes.

2 *f*. The same enlarged.

2 *g*. The specimen fig. 2 *e* enlarged, to show more distinctly the teeth and muscular impressions.

Fig. 3 *a*, *b*, *c*. LEPTOCŒLIA DICHOTOMA. 452

3 *a*. Dorsal view of the specimen.

3 *b*. Ventral view of the same.

3 *c*. Front view, showing the outline, the depression of the dorsal valve, and the incurved beak.

Fig. 4 & 5. LEPTACŒLIA PLANOCONVEXA.

*Atrypa planoconvexa* : Pal. New-York, Vol. ii, pa. 75, pl. 23, f. 11.

4 *a*, *b*. Dorsal and ventral views of a specimen of this species.

5. Interior of the dorsal valve of this species.

Fig. 6. PHOLIDOPS SQUAMIFORMIS. 490

6 *a*. Interior of a specimen of the natural size.

6 *b*. The same enlarged.

Fig. 7. PHOLIDOPS OVATUS. 490

7 *a*. Exterior of a specimen of the natural size.

7 *b*. The same enlarged.

Fig. 8 *a* – *d*. PHOLIDOPS TERMINALIS. 490

8 *a*. The exterior of the shell, of the natural size.

8 *b*. Two valves in conjunction. It is not determined that these valves are in their natural relations, and no articulating processes have been observed.

8 *c*. The interior of another specimen.

8 *d*. The same enlarged.

(BRACHIOPODA.)

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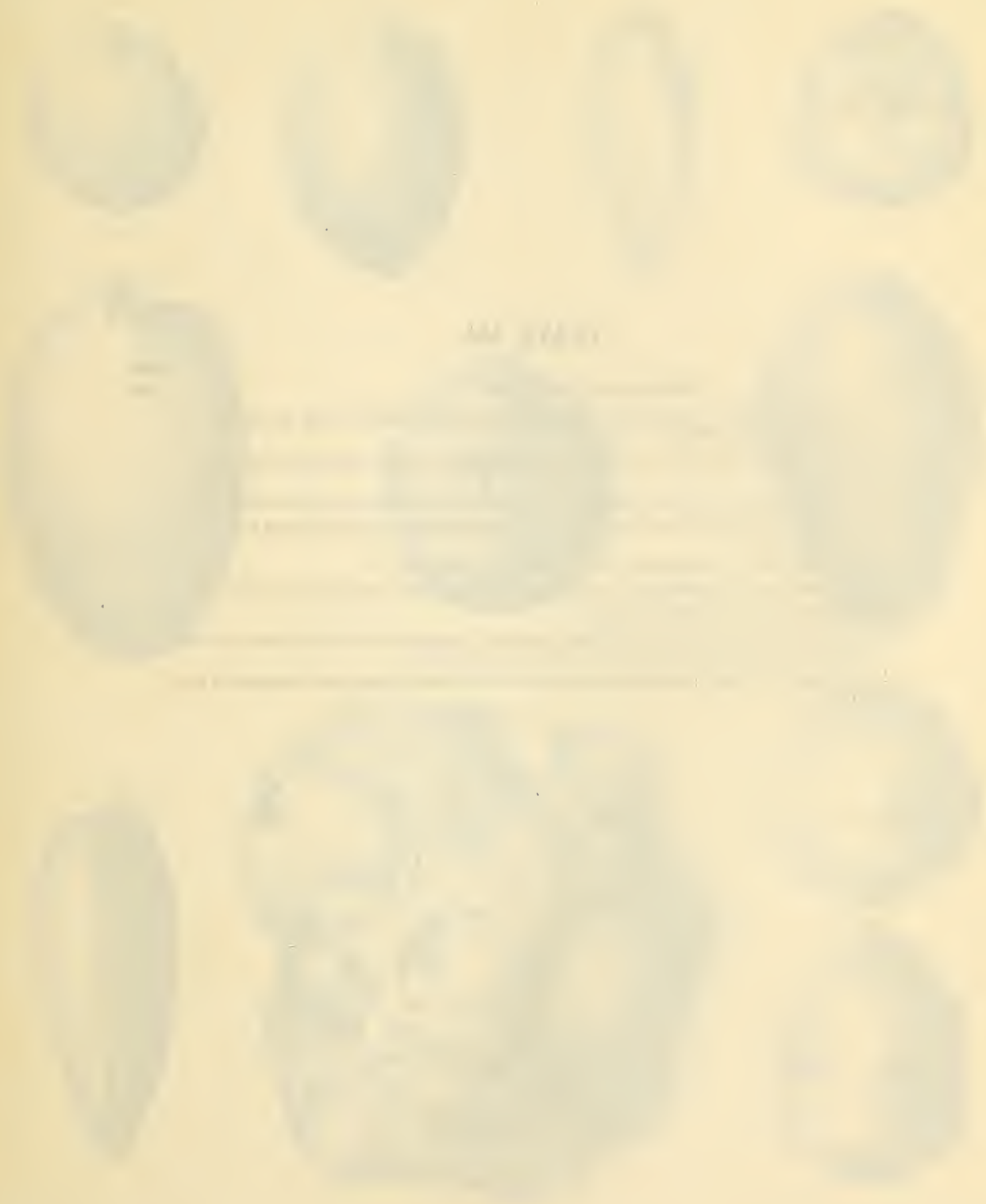
# PLATE 104.

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Fig. 1 – 4. RENSSELÆRIA OVOIDES. 456

1 *a*. The dorsal side of a young speeimen, where the length little exeeeds the width; the shell nearly all exfoliated.

1 *b*, *c*. Ventral and profile view of the east of a larger individual, preserving a little of the shell.

1 *d*. Cardinal view of a east of a speeimen of medium size, whieh is more ventrieose than 1 *b c*.

2 *a*, *b*. Dorsal and profile view of a large speeimen of elliptieal form, preserving a part of the shell in front.

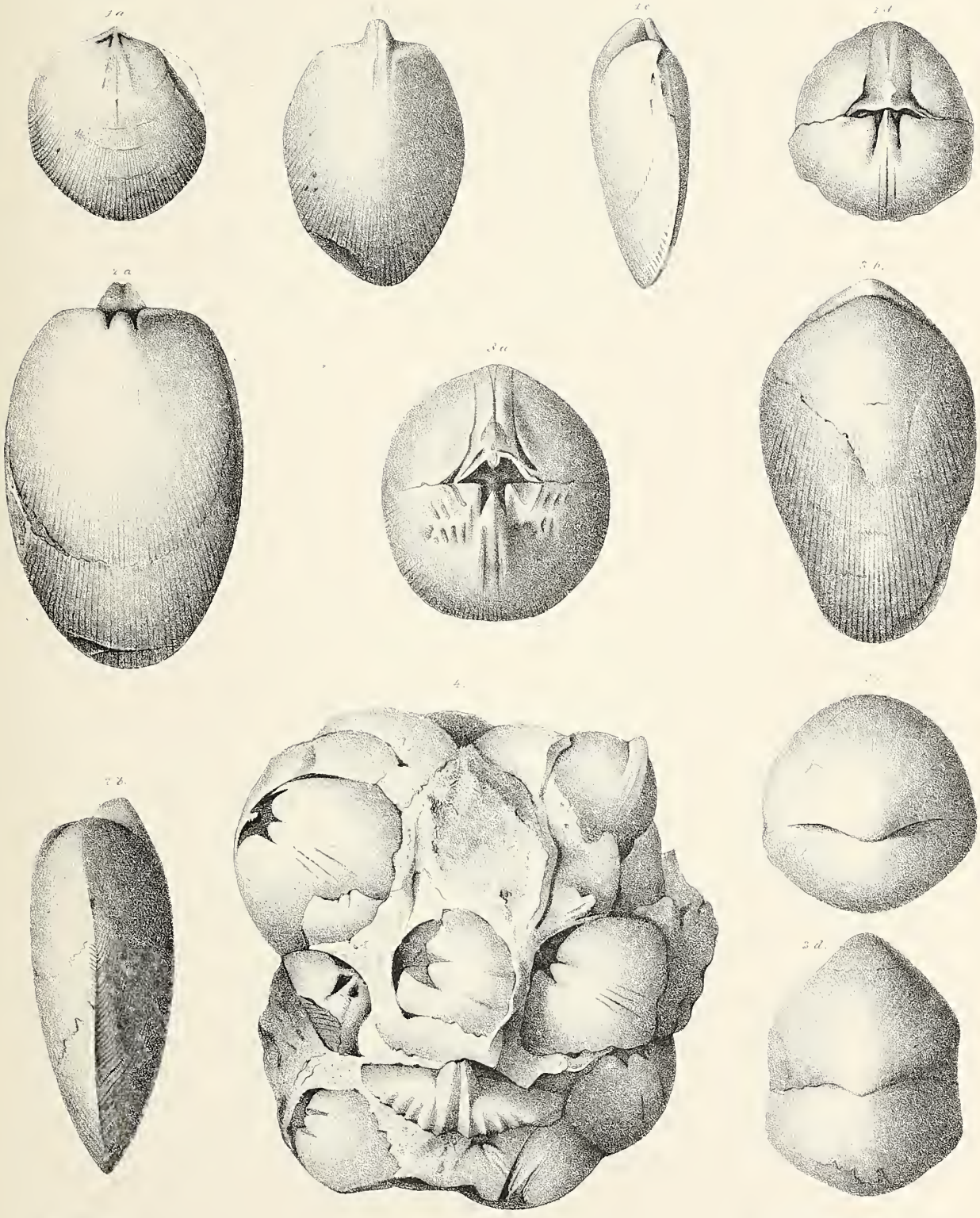
3 *a*. Cardinal view of a large east, the ventral valve uppermost.

3 *b*. Dorsal view of an individual of ovate form, preserving the greater part of the shell.

3 *c*. Cardinal view of a gibbous speeimen.

3 *d*. Cardinal view of an extremely gibbous speeimen, which is flat or slightly eoncave at the sides, and the eentre of the ventral valve strongly elevated.

4. A fragment of stone presenting the aspeet of these fossils in their usual eondition in the roek.



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# PLATE 105.

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Fig. 1 – 6. RENSSELÆRIA OVOIDES. 456

1. Dorsal valve of a full-grown individual, showing the abrupt inflection at the sides.
2. Profile of a large shell in which the parts are pretty well preserved in all their proportions; the dorsal valve being partially exfoliated, and the striæ not visible.
3. Ventral view of the preceding.
4. Dorsal view of a large specimen, which is unusually contracted at the sides on the lower half of the shell.
5. A partial cast of a ventral valve, showing the form of the muscular impressions and rostral cavity. The forms of the dental plates and teeth are seen on each side, below the beak.
6. A partial cast of a dorsal valve, showing a process reaching from the beak to the muscular impressions below. This process is the filling of the foramen, and extends from the cavity of the dorsal valve beneath the bases of the crural supports, coming out at the apex of the beak.

( BRACHIOPODA )

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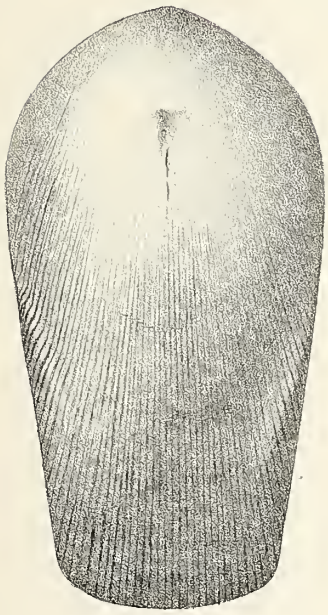

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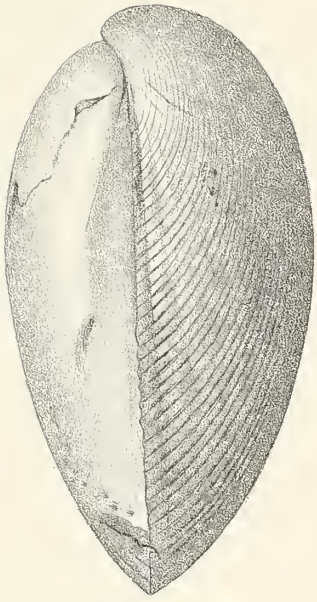

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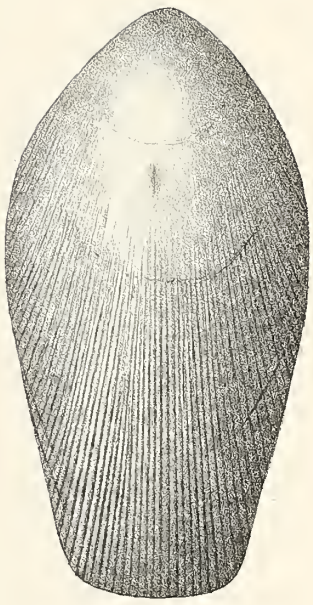

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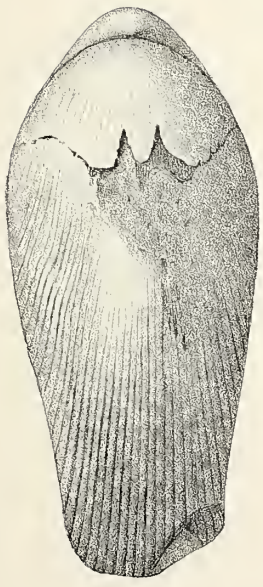

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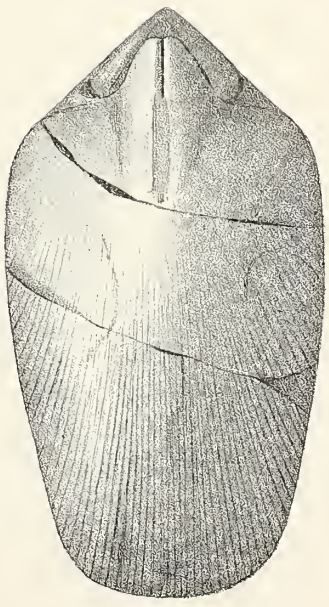

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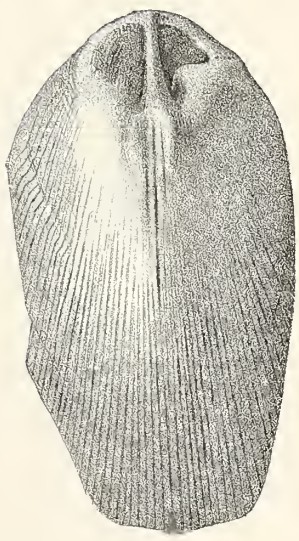

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Lith. of Rich.d H. Pease Albany

# PLATE 106.

Page

Fig. 1 *a* – *f*. LEPTOCŒLIA FLABELLITES. 449

1 *a*, *b*, *c*, *d*. Dorsal, ventral, and profile view of this species. (The figures, unfortunately, represent too many plications by two on each side of the centre.)

1 *e*. The interior of the dorsal valve, showing the cardinal process, etc.

1 *f*. A cast or impression of a larger dorsal valve.

Fig. 2 *a* – *l*. RENSSELÆRIA OVALIS. 458

2 *a*. The ventral valve of a specimen, which partially preserves the shell on the upper part.

2 *b*. Another specimen from which the shell is partially removed.

2 *c*. Profile of the same, showing the inflected margins of the shell. The specimen has been flattened by pressure.

2 *d*. Ventral view of a well-preserved cast of this species.

2 *e*. Dorsal view of the same, showing the muscular impression, imprints of the hinge-plates, and the dental plates preserved in the cast of the rostral cavity of the opposite valve.

2 *f*. Profile view of the preceding specimen.

2 *g*. The upper portion of the preceding specimen enlarged. The indentations on the hinge-line are due to marks sometimes shown on the valves of old specimens of some or all the species of this genus.

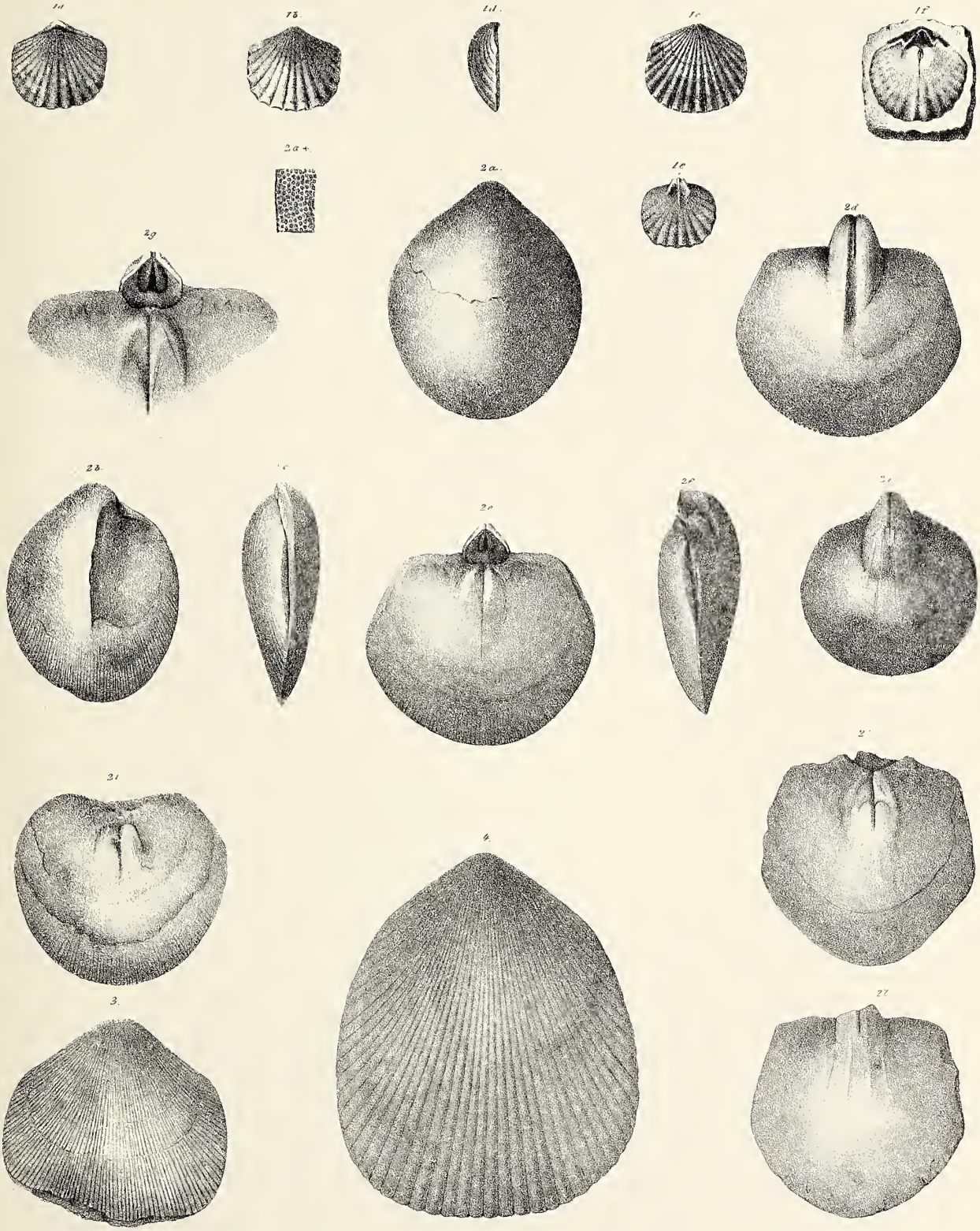
2 *h*. The cast of a smaller specimen, showing the muscular area and the marks of the adductor muscles.

2 *i*, *k*, *l*. Dorsal and ventral views of imperfect casts of this species.

# ORISKANY SANDSTONE.

BRACHIOPODA.



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# PLATE 107.

Page

Fig. 1 – 15. RENSSELÆRIA SUESSANA. 459

1. Dorsal view of a specimen of a symmetrically oval form.
2. A specimen showing a more prominent beak and contracted front.
3 *a*, *b*. Ventral and dorsal views of a specimen of less extreme form than the preceding.
4. An elongate form which is more symmetrically oval.
5 *a*. Dorsal view of a small specimen of the prevailing or characteristic form.
5 *b*. Profile view of the preceding, showing a scarcely perceptible incurving of the valves at their lateral margins.
5 *c*. Dorsal view of an older specimen, showing the perfect condition of the shell.
5 *d*. Profile view of the same, showing the inflected margins of the shell.
5 *e*, *f*, *g* & *h*. Dorsal, ventral, and profile views of a full-grown specimen of this species.
6. A cast of a similar form.
7. The interior of two ventral valves, one preserving the deltidial plates and the other without them. The muscular impressions are but feebly preserved.
8. The interior of two dorsal valves; the one showing the hinge-plates in their usual form, and the upper one having them much thickened : in the latter, the crura diverge at their origin, while in the other they proceed in a longitudinal direction for a short distance before bifurcating.
9. The dorsal valve, showing the hinge-plates, dental fossets, foramen, crura and crural plate, and appendages. The figure is slightly enlarged.
10. The figure of a similar specimen, where the hinge-plates are much thickened and rounded, the crura branching near the base, and the crural plate narrower than in the preceding.
11. A diagram showing a longitudinal section of the two valves in connexion, with the crura and appendages.
12, 13, 14 & 15. Figures showing the variety of form of the crural plate, as observed in several individuals of this species.

# ORISKANY SANDSTONE.



(BRACHIOPODA.)

Swinton, lith.

# PLATE 108.

Page

Fig. 1 *a* – *f*. RENSSELÆRIA CUMBERLANDIÆ. 464

1 *a*, *b*, *c*. Ventral, dorsal and profile views of an entire specimen.

1 *d*, *e*, *f*. Ventral, dorsal and profile views of an imperfect specimen, the dorsal view showing the triangular foramen which results from the removal of the deltidial plates.

Fig. 2 *a*, *b*, *c*. RENSSELÆRIA INTERMEDIA. 463

2 *a*. Dorsal view of a well-preserved specimen.

2 *b*, *c*. Profile views of different individuals of the same species.

Fig. 3 *a* – *m*. RENSSELÆRIA MARYLANDICA. 461

3 *a*. Dorsal view of a specimen of this species.

3 *b*. Ventral view of the same.

3 *c*. Profile or lateral view of the same.

3 *d*. Cardinal view of the same, having the ventral side upwards.

3 *e*. Front view (not well shown in the figure).

3 *f*. The apex of the ventral valve (somewhat enlarged), showing the foramen, and the deltidial pieces forming the lower side of the foramen. The outer margins are too thick in the figure.

3 *g*. The interior of the ventral valve, showing the teeth, the dental plates, and muscular impression.

3 *h*. A similar specimen where the cavity of the valve is not so deep, showing the form of the muscular area and the places of the adductor muscles. The inner edges of the dental plates are seen extending into the cavity of the foramen.

3 *i*. The rostral portion of the two valves joined at the hinge : the dorsal valve is downwards, showing the bases of the crural plates and the ridges proceeding from these. The opening of the foramen between the bases of the crural processes is very perceptible.

3 *k*. The interior of the upper part of a dorsal valve, showing the broad hinge-plates, the bases of the crura, the elevated median process, and the foramen below the apex.

3 *l*. Diagram of the interior of the dorsal valve, showing hinge-plates, dental sockets, apicial foramen, crural processes and crural plate. In the specimen from which this figure is taken, these processes are all encased in crystalline matter, the form and direction of the parts alone being visible. The slender process at the base of the crural plate is broken off; and since its entire length is unknown, the base alone is represented.

3 *m*. A diagram representing a longitudinal section of the shell, and the internal apparatus of the two valves when connected.

# ORISKANY SANDSTONE.



(BRACHIOPODA.)

Swinton, lith.

# PLATE 109.


Page

Fig. 1 & 2. AVICULA TEXTILIS, *var.* ARENARIA. 465

1. An impression made in sandstone by the exterior surface of the smaller or right valve.
2. The imprint of the exterior of the left valve of this species.

Fig. 3. AVICULA RECTICOSTA. 466

Fig. 4. MEGAMBONIA BELLISTRIATA. 467

4. A cast of the left valve, from a mould of the exterior in sandstone.

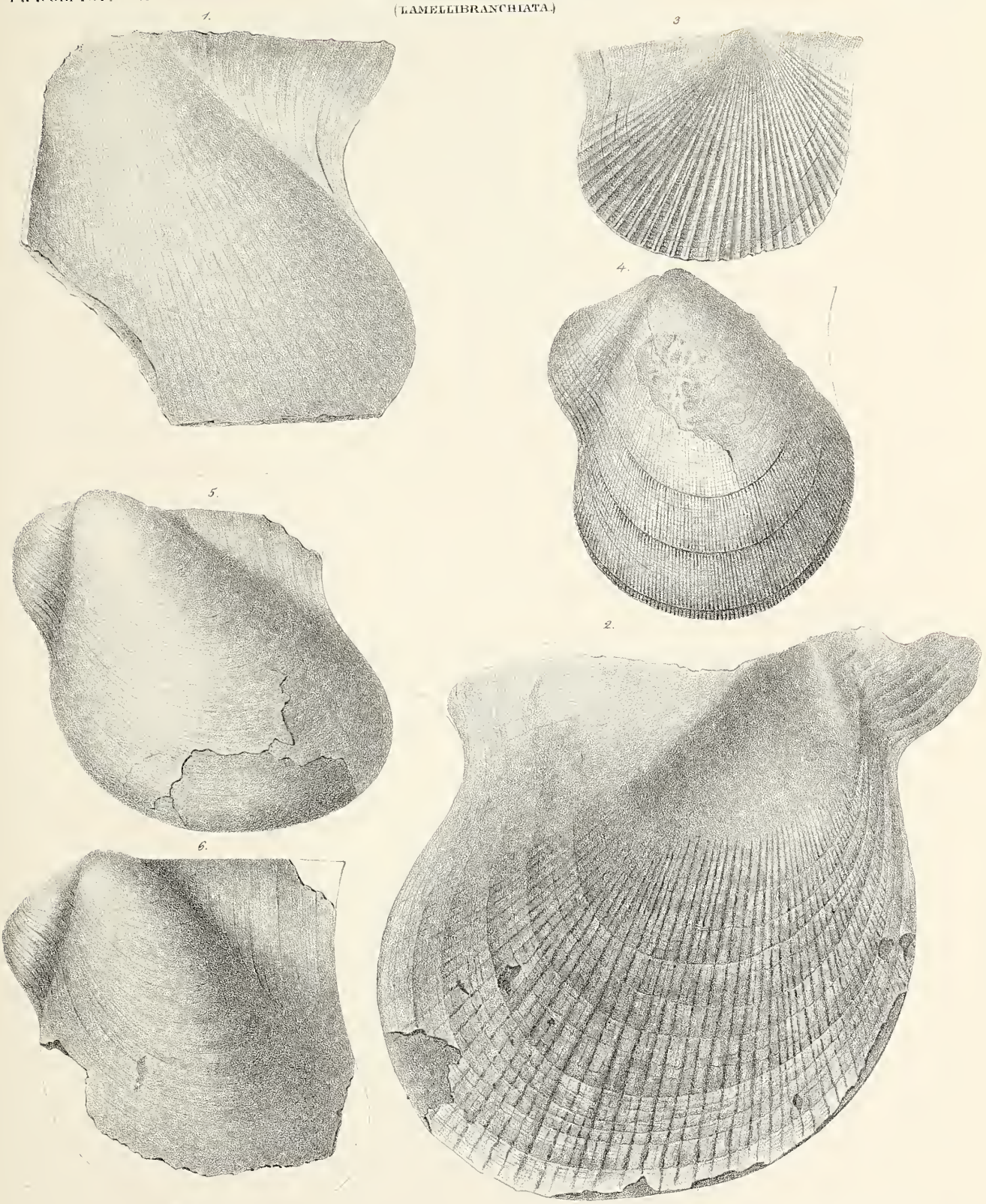
Fig. 5 & 6. MEGAMBONIA LAMELLOSA. 467

5. The left valve of a specimen of this species.
6. The left valve, showing a proportionally more extended wing than the preceding.

# ORISKANY SANDSTONE.

(LAMELLIBRANCHIATA.)



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# PLATE 110.

Page

Fig. 1. AVICULA GEBHARDI. 466

1 *a*. A cast of the left valve of a specimen.

1 *b*. A smaller specimen, in which the ribs are better preserved.

Fig. 2. AVICULA TEXTILIS, *var.* ARENARIA. 465

2. The exterior surface of a weatbered and exfoliated specimen of the left valve.

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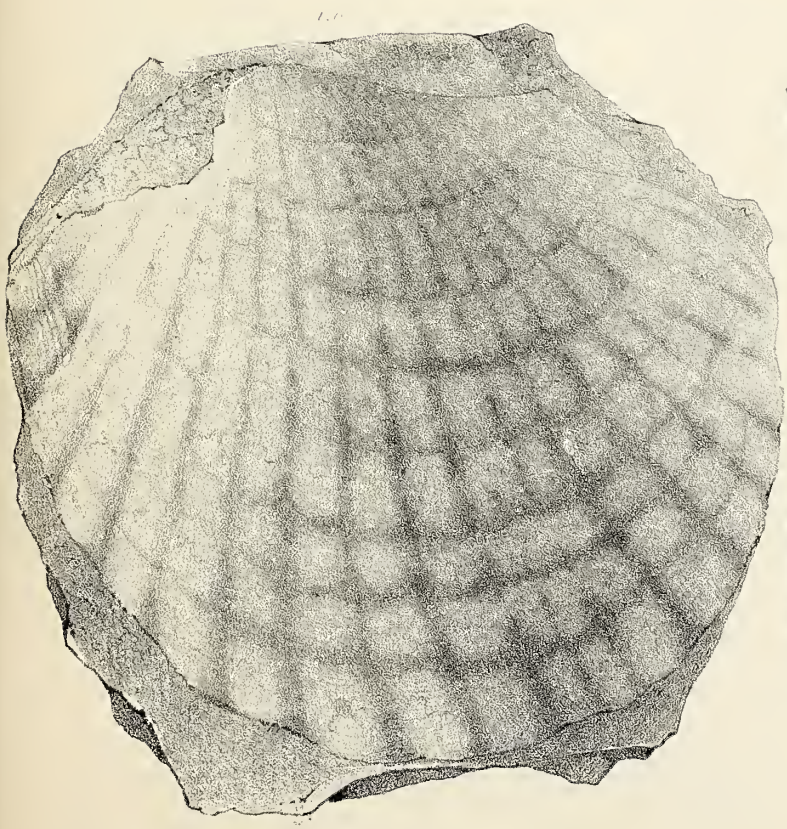

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J. WATSON DEL. E. MEEK

# PLATE 111.

Page

Fig. 1. CONULARIA LATA. 479

1. A fragment preserving the impression of parts of two sides : the extreme length of one side, which is imperfect both above and below, is five inches.

Fig. 2. AVICULA GEBHARDI. 466

2. The cast of the left valve of a large individual of this species.

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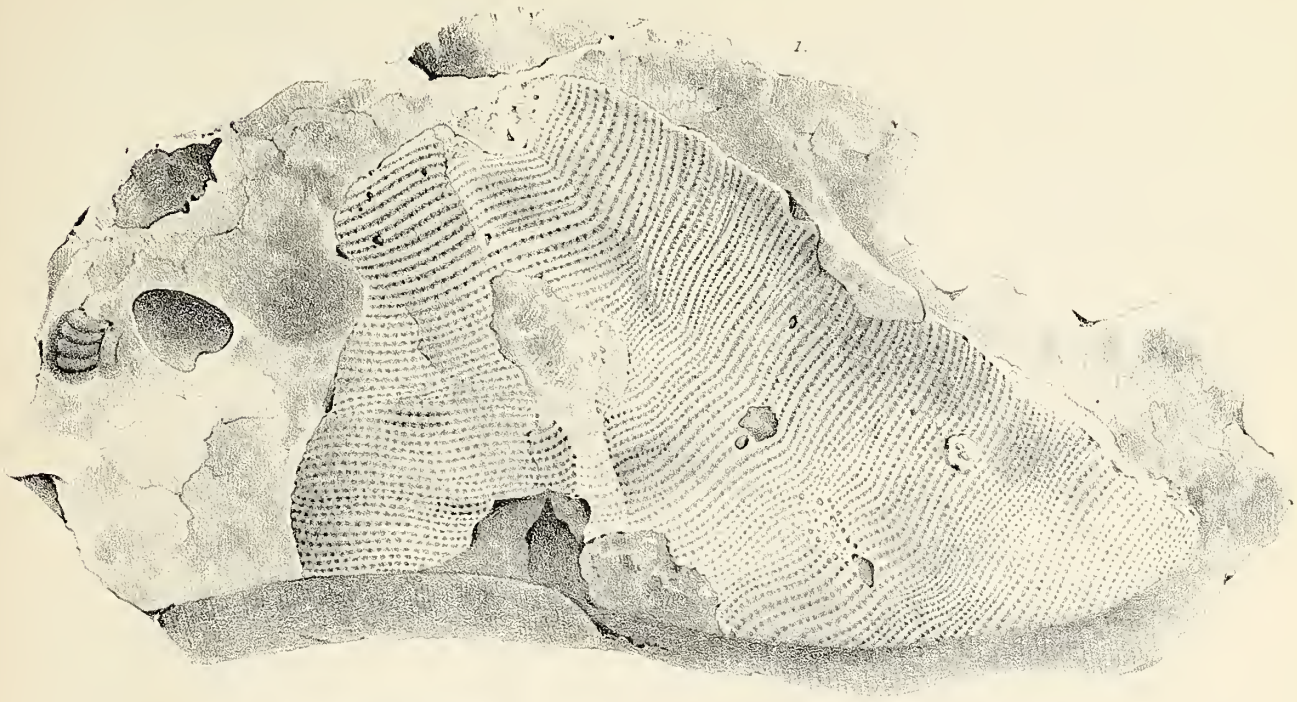


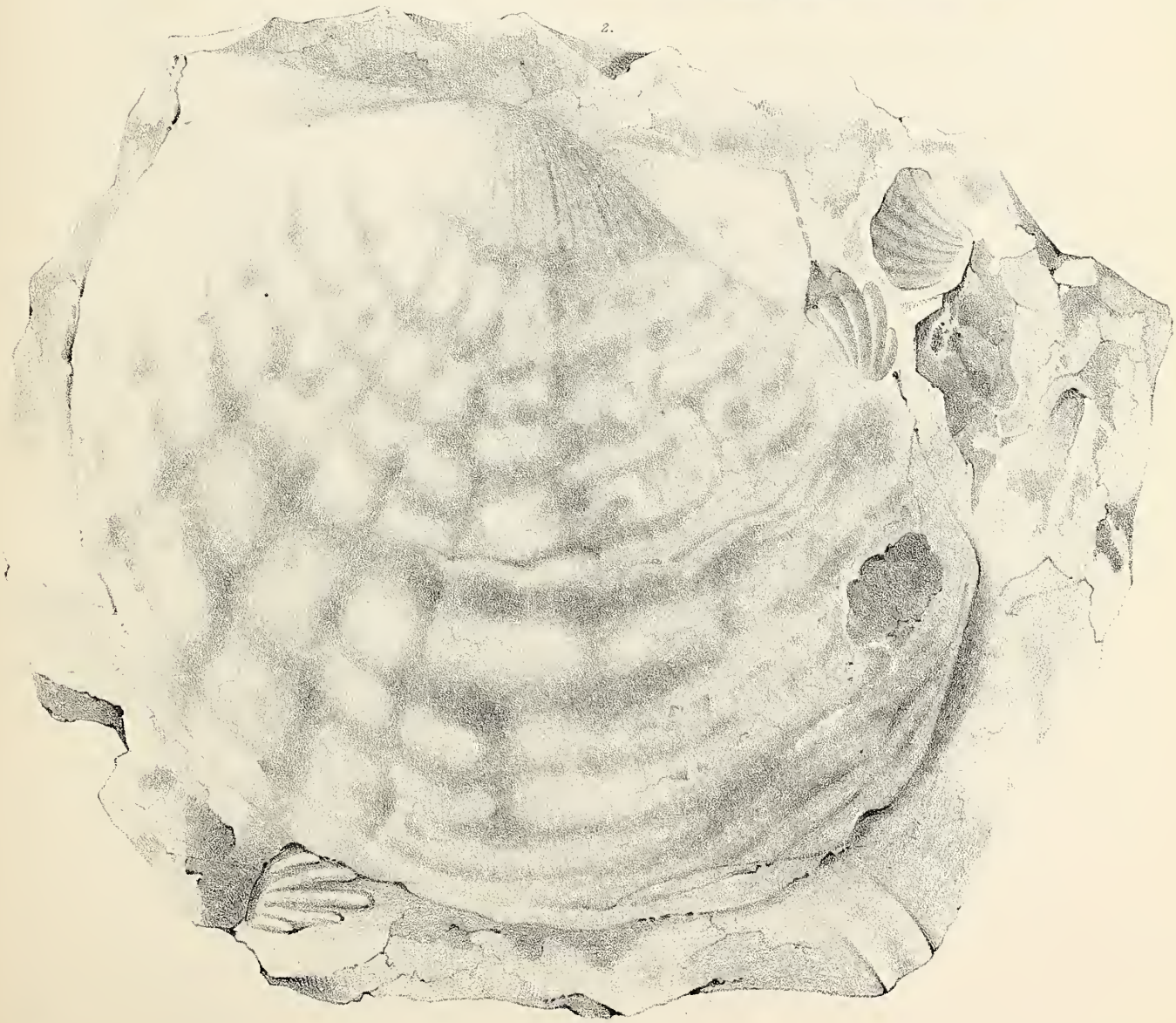


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# PLATE 112.

Page

Fig. 1 – 10. PLATYOSTOMA VENTRICOSA. 469

1 & 2. Young shells of this species.

3. A young specimen, showing a broadly undulating surface.

4 *a*. View of the aperture of the same.

4 *b*. An older specimen of the ordinary form.

5 *a*, *b*. View of the spire, and of the aperture of a specimen of medium size.

5 *c*. Profile of a specimen which is somewhat depressed vertically.

6. A young specimen with a more elevated spire. This is of the type of *P. arenosa* of CONRAD (See Plate LVII).

7 & 8. View of the spires of two specimens of ordinary form.

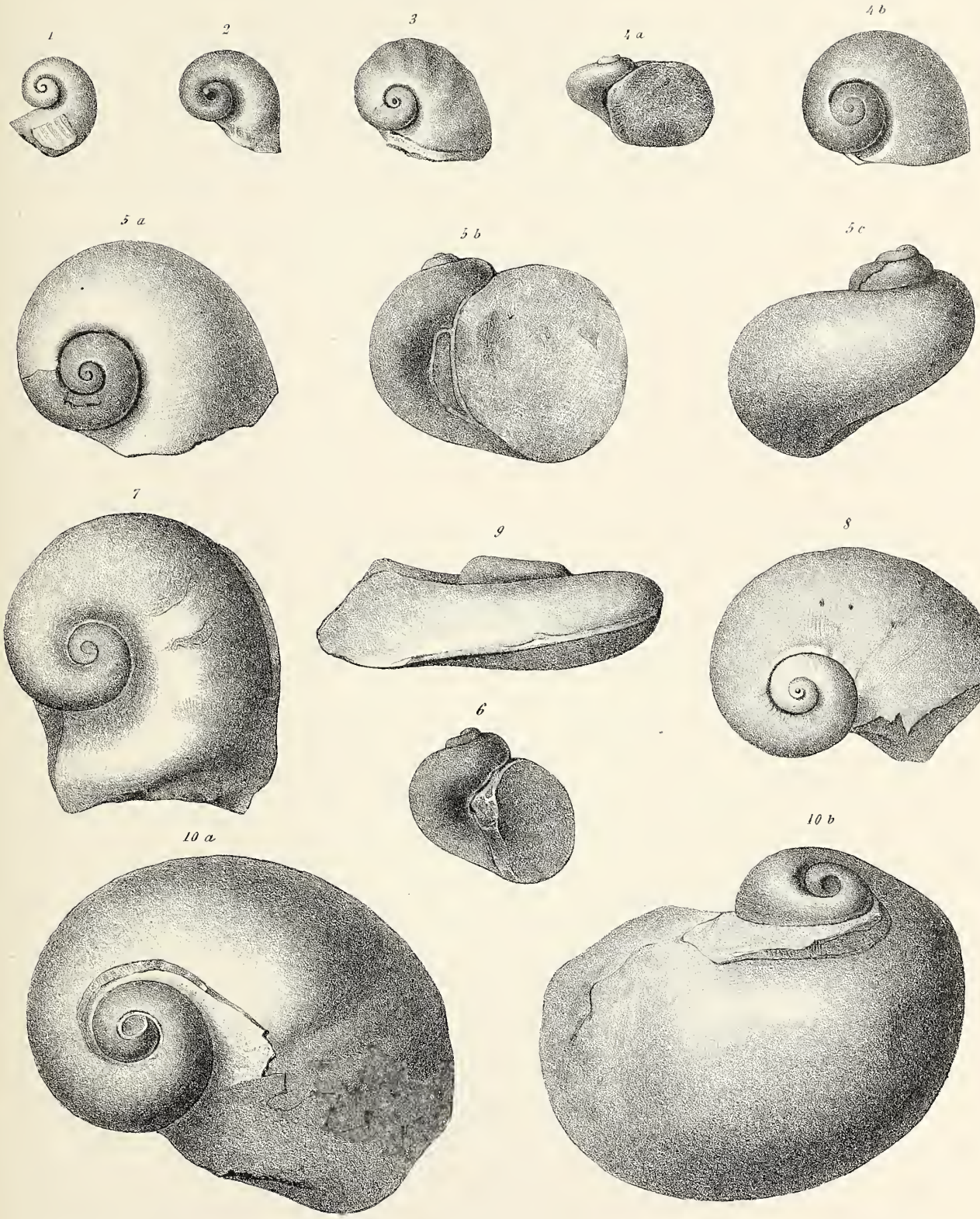
9. A specimen which has been vertically compressed.

10 *a*, *b*. View of a specimen which is a little compressed obliquely.

# ORISKANY SANDSTONE

(GASTEROPODA)



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R. H. Pease, Lith. Albany.

# PLATE 113.

Page

Fig. 1 – 5. PLATYCERAS TORTUOSUM. 472

1 – 5. Views of different individuals (which are more or less perfect), showing a gradation in size.

Fig. 6. PLATYCERAS ? 473

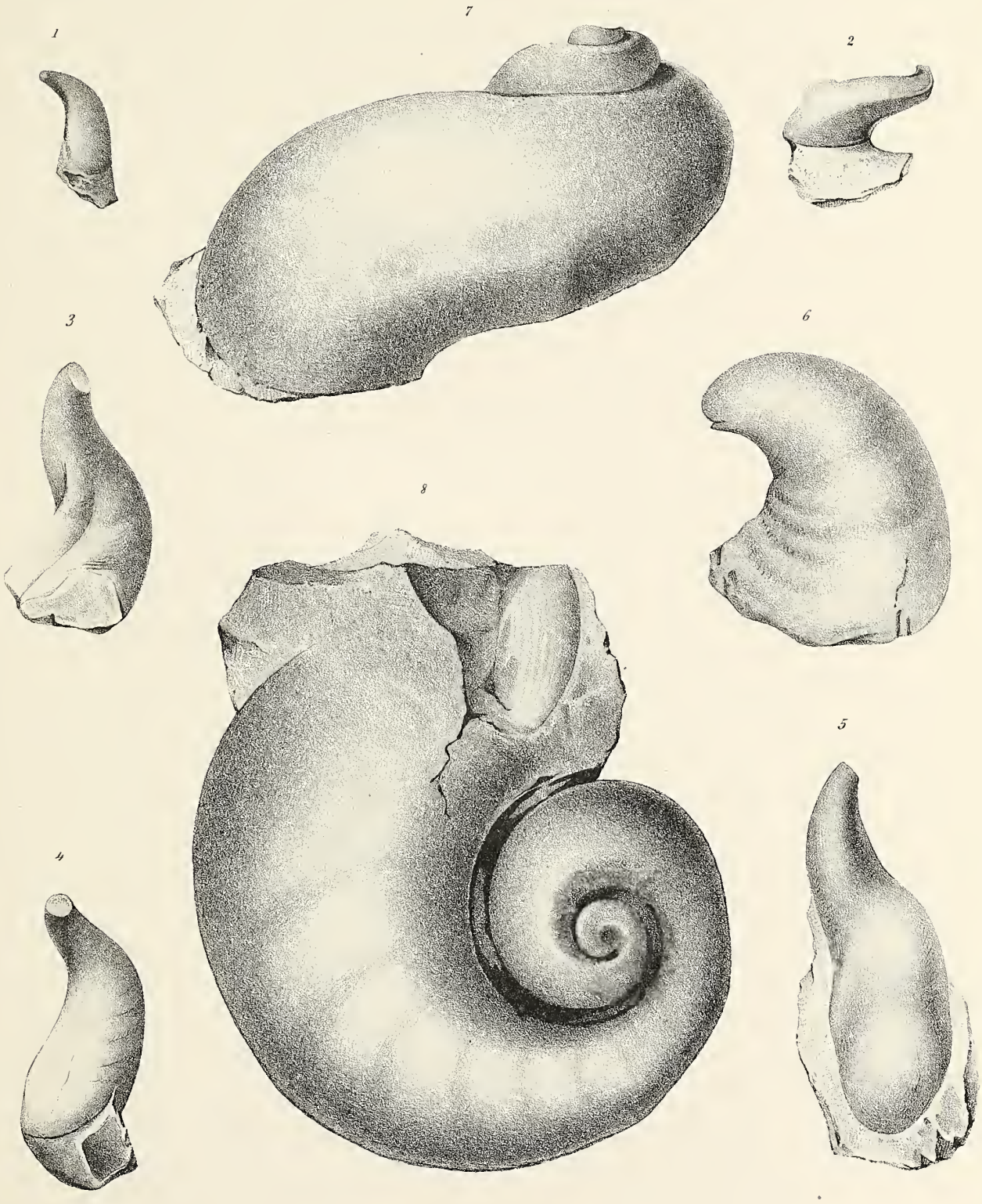
6. A cast; the specimen too imperfect for determination.

Fig. 7 & 8. PLATYOSTOMA VENTRICOSA. 469

7. Profile of the spire of a very large specimen, which has been somewhat compressed vertically.

8. View of the spire of the same specimen. The surface shows broad undulations parallel to the lines of growth.

GASTEROPODA



# PLATE 114.

Page

Fig. 1. STROPHOSTYLUS TRANSVERSUS. 470

1 *a*. View of the spire.

1 *b*. View of the aperture, which is narrowed by turning the upper margin forward.

1 *c*. Profile view of the shell from the upper side.

Fig. 2 & 3. STROPHOSTYLUS EXPANSUS. 470

2. A small specimen which is obliquely compressed. The peristome is extended around the adjacent volution, giving it a different aspect from the other specimens of the same species.

3 *a*. View of the aperture, showing its form, with the outer angle of the columellar lip.

3 *b*. View of the upper side of the spire and the expanded body volution.

Fig. 4 & 5. CYRTOLITES? EXPANSUS. 479

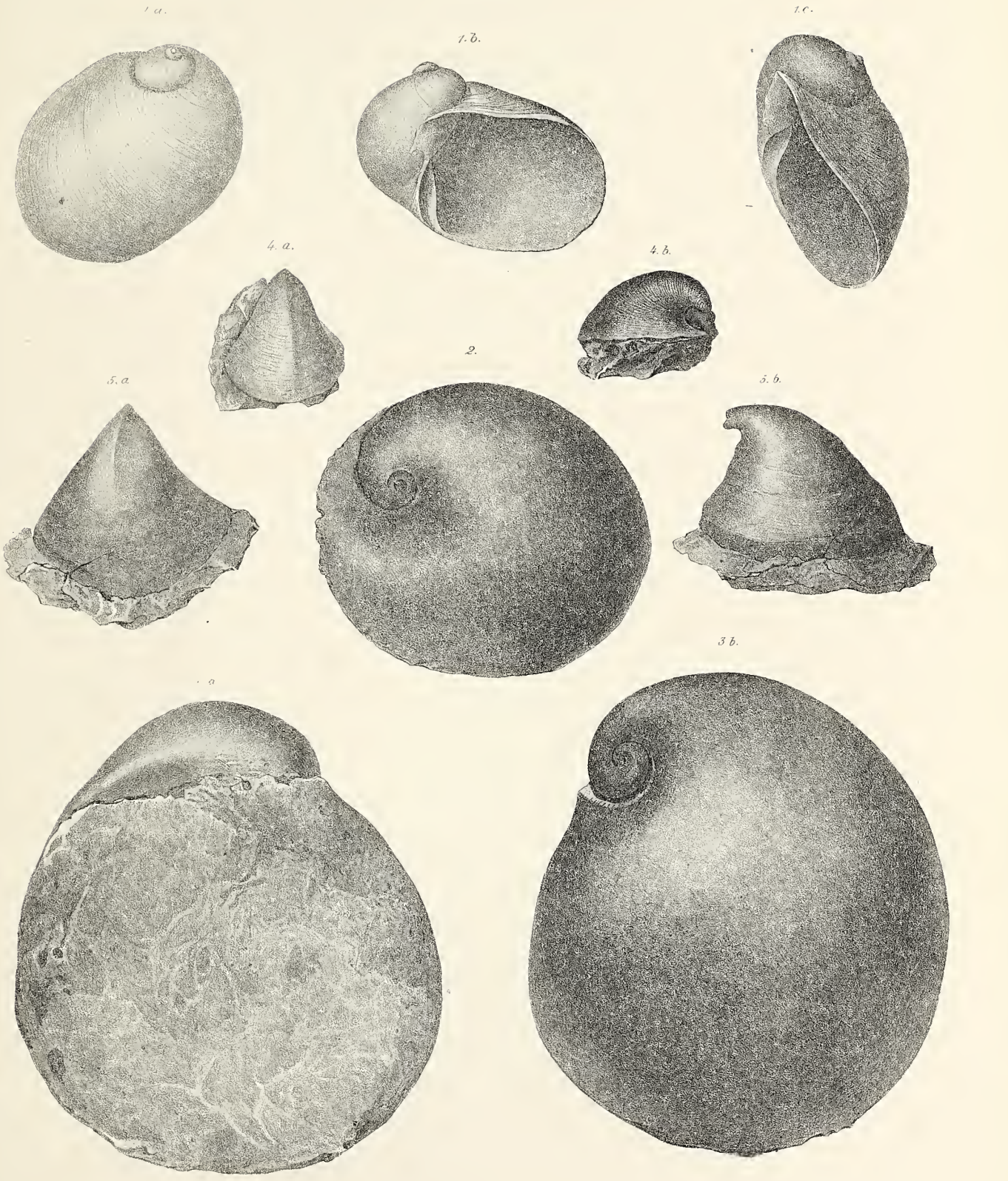
4 *a*, *b*. Anterior and lateral views of the smaller specimen.

5 *a*, *b*. Anterior and lateral views of the larger specimen.

# OHIO. CHEMUNG. CATSKILL. OR ISKANY SANDSTONE.

(GASTEROPODA.)



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# PLATE 115.

Page

Fig. 1 – 6. PLATYCERAS NODOSUM. 473

1 *a*, *b*, & 2. Young specimens of this species, preserving about two volutions.

3 *a*, *b*, *c*. A young specimen which preserves the proper form of the shell.

4. A larger individual.

5. A larger specimen, preserving little more than a single volution.

6. A larger specimen of similar character with the preceding.

Fig. 7. PLATYCERAS SUBNODOSUM. 474

7. View of the upper side of the spire.

Fig. 8. PLATYOSTOMA VENTRICOSA. 469

8. A fragment of a specimen, apparently of this species, preserving a little more than one volution and a part of the aperture, with the pillar-lip, which is thickened and smooth.

1a

2

3a

3b

1b

7

3c

5

4

6

8

F.B. Meek, del.

R.H. Pease, Lith. Albany.

# PLATE 116.

Page

Fig. 1 – 4. PLATYCERAS NODOSUM. 473

1 & 2. Casts of this species, preserving the usual form.

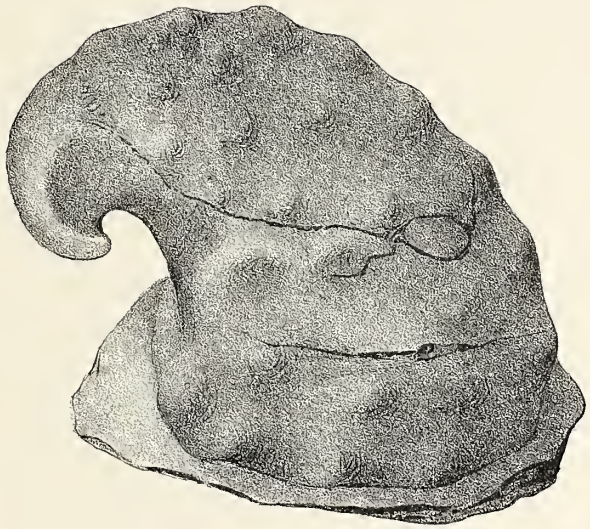
3 & 4. View of the upper and lower side of the cast of a large individual. In this specimen, the nodes, either from weathering or extreme age and thickening of the shell, are less prominent than in the preceding.

# ORISKANY SANDSTONE.

(GASTEROPODA.)



1.



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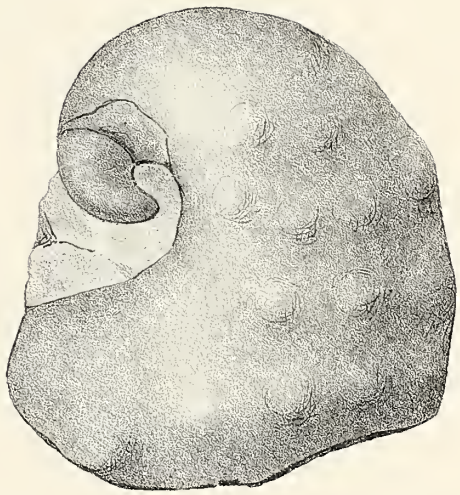

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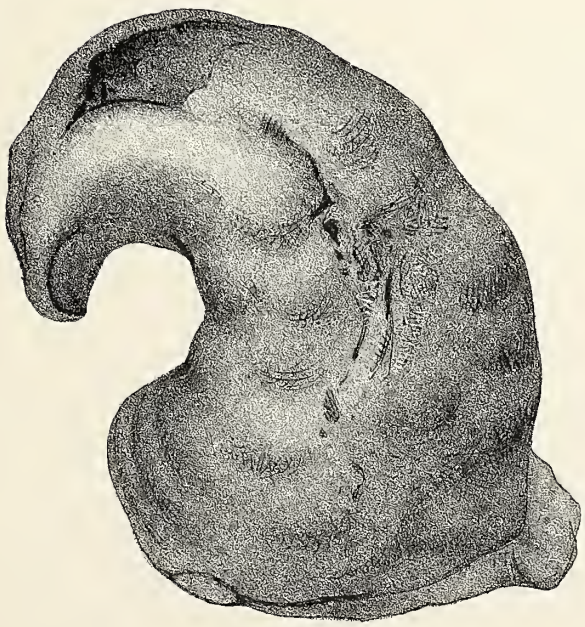

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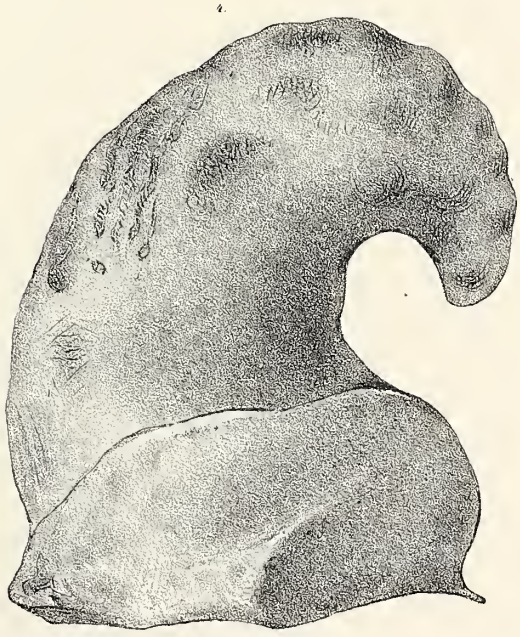

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# PLATE 117.

Page

Fig. 1 – 10. PLATYCERAS GEBHARDI. 474

1 *a*, *b*. A young shell, in which the peristome is closely adhering to the body whorl.

2. A similar specimen with the preceding.

3 *a*, *b*. A larger individual of the same character.

4. A specimen where the peristome is more expanded.

5 *a*, *b*. A specimen in which the peristome is free and not expanded.

6 *a*, *b*. A larger specimen, in which the peristome is expanded and free.

7, 8 & 9. Specimens in which the peristome is not expanded, or but slightly expanded and essentially free.

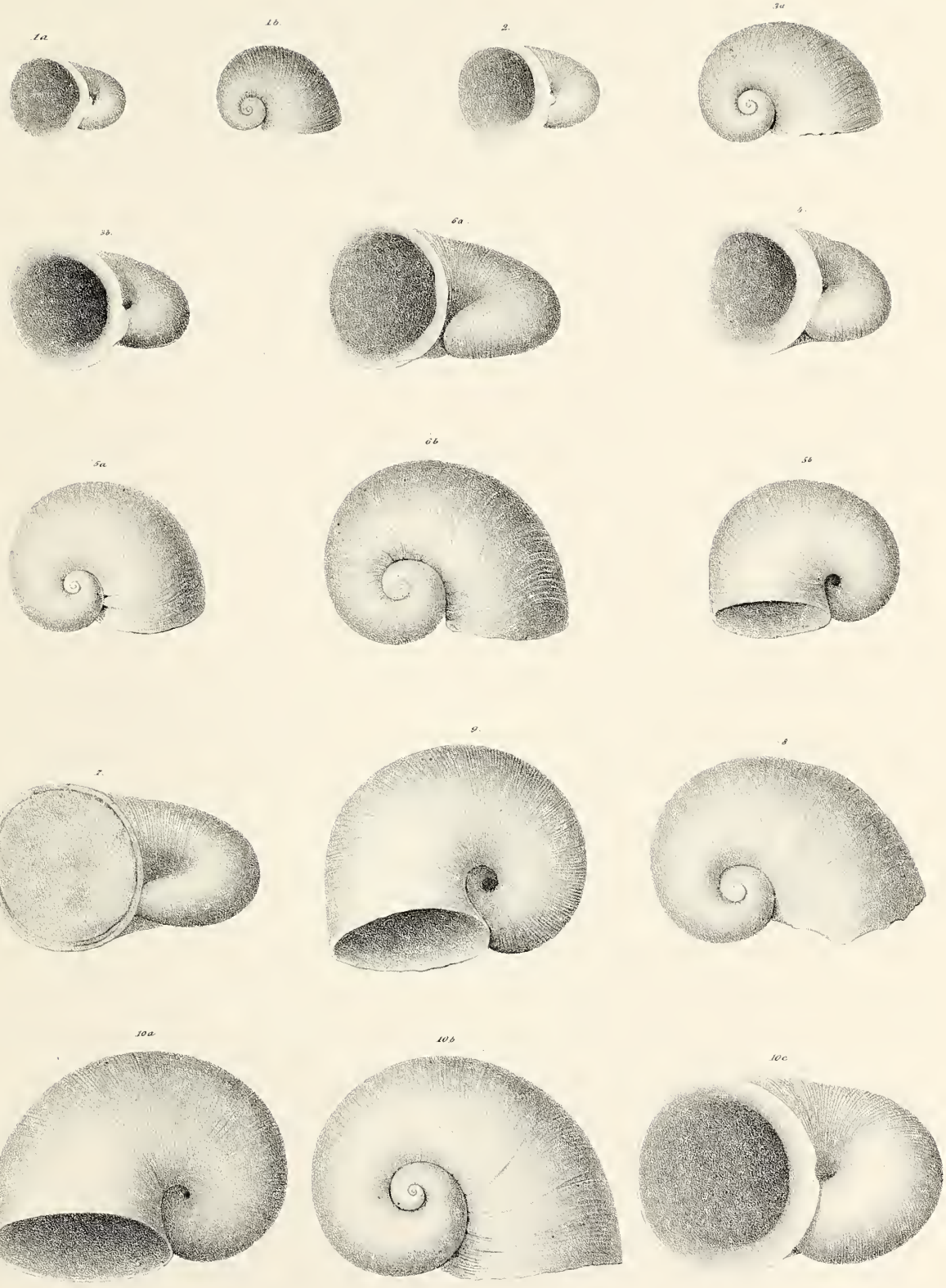
10 *a*, *b*. Two views of a large specimen with a free peristome and small umbilicus.

10 *c*. A specimen with expanded aperture, the peristome adjacent to the body volution, but still free. The umbilicus is much larger than in the preceding specimen.

# ORISKANY SANDSTONE.

(GASTEROPODA)






F. B. Meek, del.

Swinton, lith.

# PLATE 118.

Page

Fig. 1. STROPHOSTYLUS MATHERI. 471

1 *a*. Profile view of the spire.

1 *b*. View of the aperture, which is imperfect in outline, the columellar side being broken off.

Fig. 2. STROPHOSTYLUS ANDREWSI. 472

2. View of the aperture, columellar lip, etc. The figure does not represent the aperture sufficiently circular.

Fig. 3 – 9. PLATYCERAS VENTRICOSUM. 475

3 *a*, *b*. Views of a young specimen in which the peristome is not continuous; the body whorl encroaching on the aperture, with an attenuated film of the labrum covering it, the lower side curving into the umbilicus, and the margin below the volution reflexed nearly parallel with the axis. In the figure, the labrum is too distinctly shown upon the body volution.

4 & 5. Views of a small specimen of the usual form, with a widely expanded aperture. The peristome is only slightly sinuate from the encroachment of the body volution.

6 *a*, *b*. Views of a specimen above the medium size, where the volutions are in contact, the peristome free and moderately expanded.

7 *a*. A larger specimen in which the peristome is continuous, but joined to the body volution and abruptly deflected below, giving the appearance of a columellar lip. The figure represents very imperfectly the extent of the sinuosity and the form of the lip below the volution.

7 *b*. The upper side of the spire of the same specimen, showing a broad sinuosity in the margin.

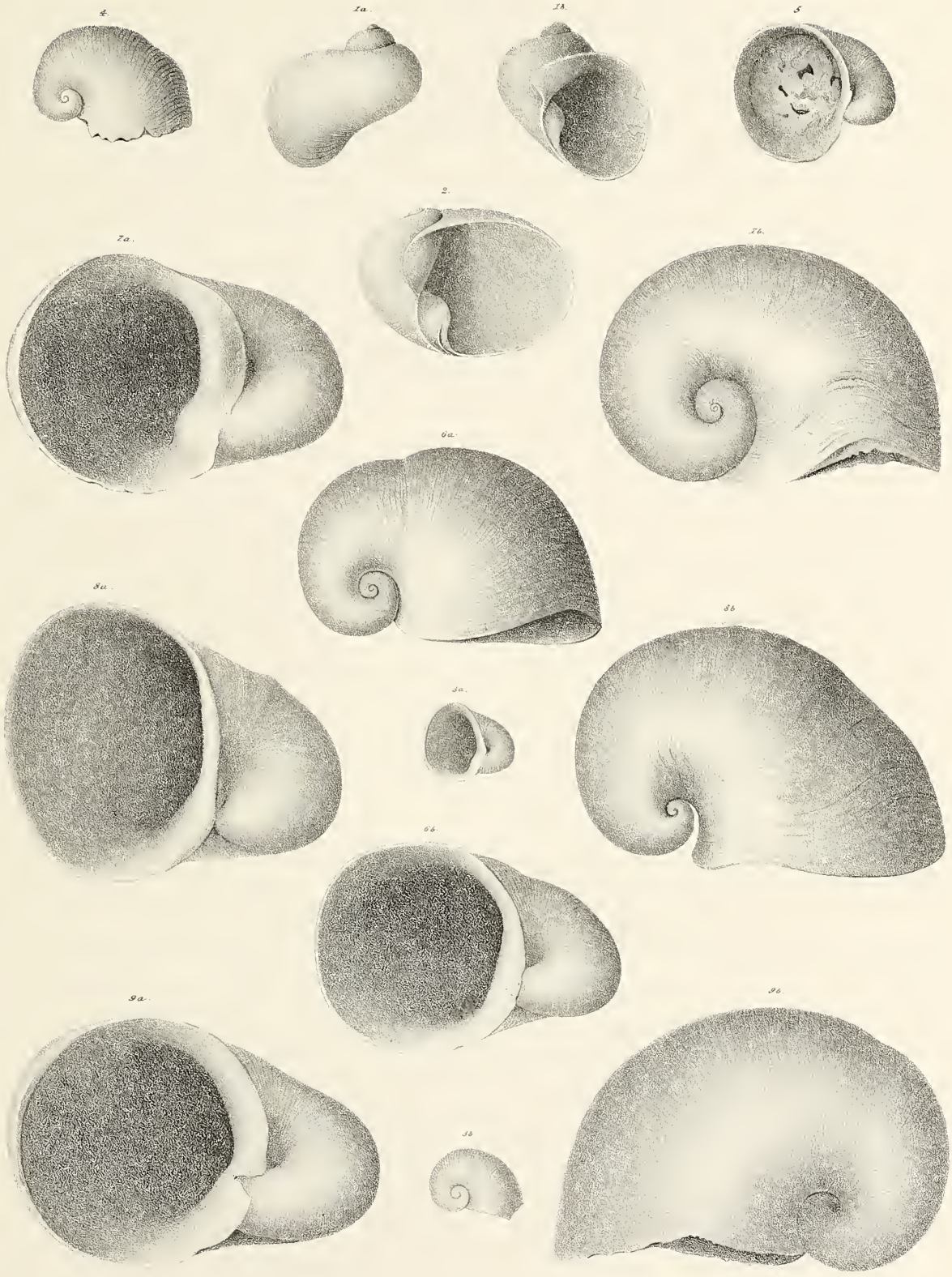
8 *a*, *b*. Views of the aperture and of the spire of a large individual, where the last volution is free, and the peristome continuous and somewhat expanded on the left side.

9 *a*, *b*. The aperture and lower side of a large specimen, where the volutions are contiguous, the umbilicus is very small, and the peristome continuous; the outline slightly sinuate just below the body volution, and expanded upon that side.

# ORISKANY SANDSTONE.

(GASTEROPODA)



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Swinton, lith.

# PLATE 119.

Page

Fig. 1, 2, 4, 5 & 6. PLATYCERAS MAGNIFICUM. 476

1 *a*, *b*. View of the spire and aperture of a young shell. The volutions are actually free to the apex, though not distinctly represented in the figure.

2 *a*, *b*. A larger specimen with free volutions, having the aperture abruptly expanded.

4 *a*, *b*. A larger specimen, with the volutions free and the peristome less expanded.

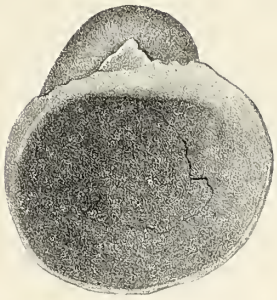
5 *a*, *b*. A larger specimen, having the apex broken off. This specimen presents a sinuosity in the posterior side of the aperture.

6 *a*, *b*. View of the aperture and spire of a large specimen in which all the parts are symmetrical and well preserved, and the volutions are free except at the extreme apex. This figure is represented as of the natural size; the extreme length being three inches and three-fourths, while the aperture is two inches and three-eighths in height, and a little more than two inches and a half in length.

Fig. 3. PLATYCERAS PATULUM. 477

View of the aperture where the peristome is spread over the body volution, and thickened below.

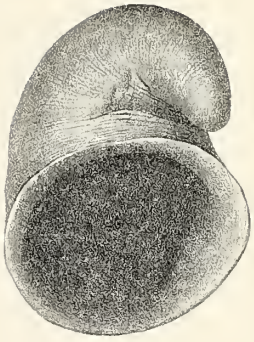
3.



1.a

1.b

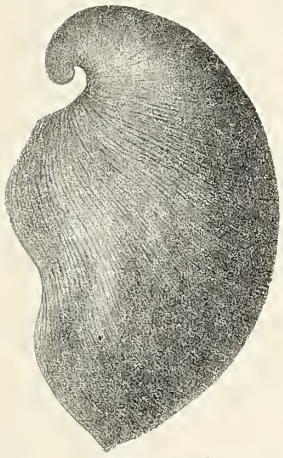
4.a



2.a.

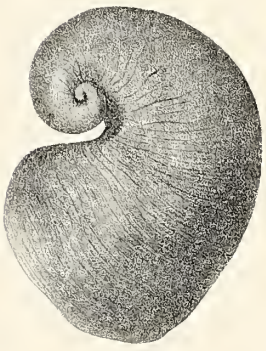
2.b.

5.a.



5.b

4.b.



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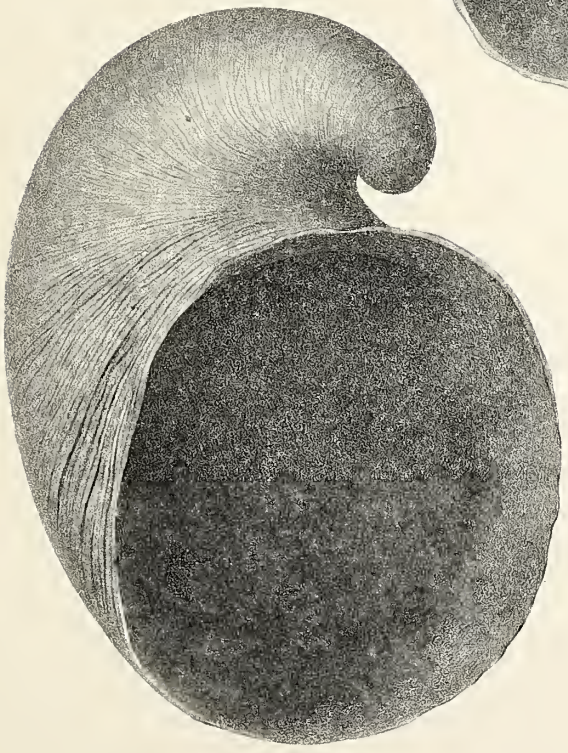

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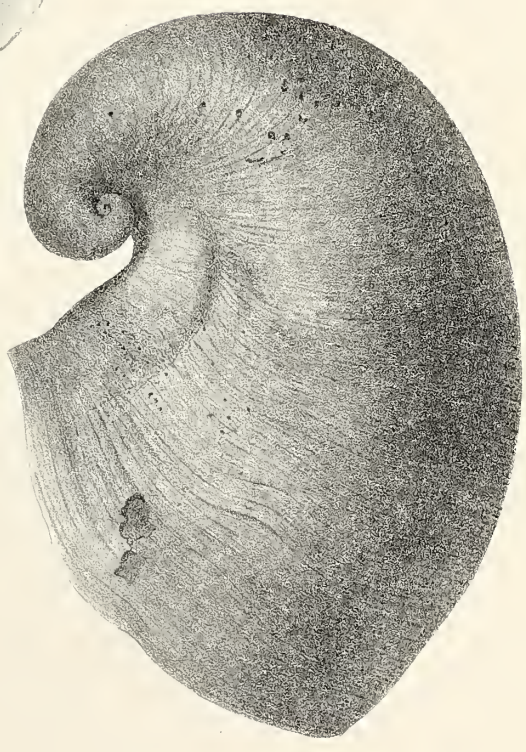


# PLATE 120.

Page

Fig. 1 – 7. PLATYCERAS REFLEXUM. 477

1 *a*, *b*. View of the upper side of the spire, and of the aperture of a small specimen.

2 *a*, *b*. Similar views of a shorter form of the same species.

3. A larger specimen of the same species.

4. A specimen in which the first volution of the spire is concealed. The surface shows some obscure marks of spiral plications.

5. A large specimen in which the last volution is more than usually deflected, standing almost at a right angle with the preceding volution.

6 *a*, *b*. Two views of a specimen in which the aperture is obtusely quadrangular.

7 *a*, *b*. A similar specimen with the preceding, where the last volution is less deflected than usual from the direction of the preceding volutions.

Fig. 8. PLATYCERAS? (PLATYOSTOMA?) CALLOSUM. 478

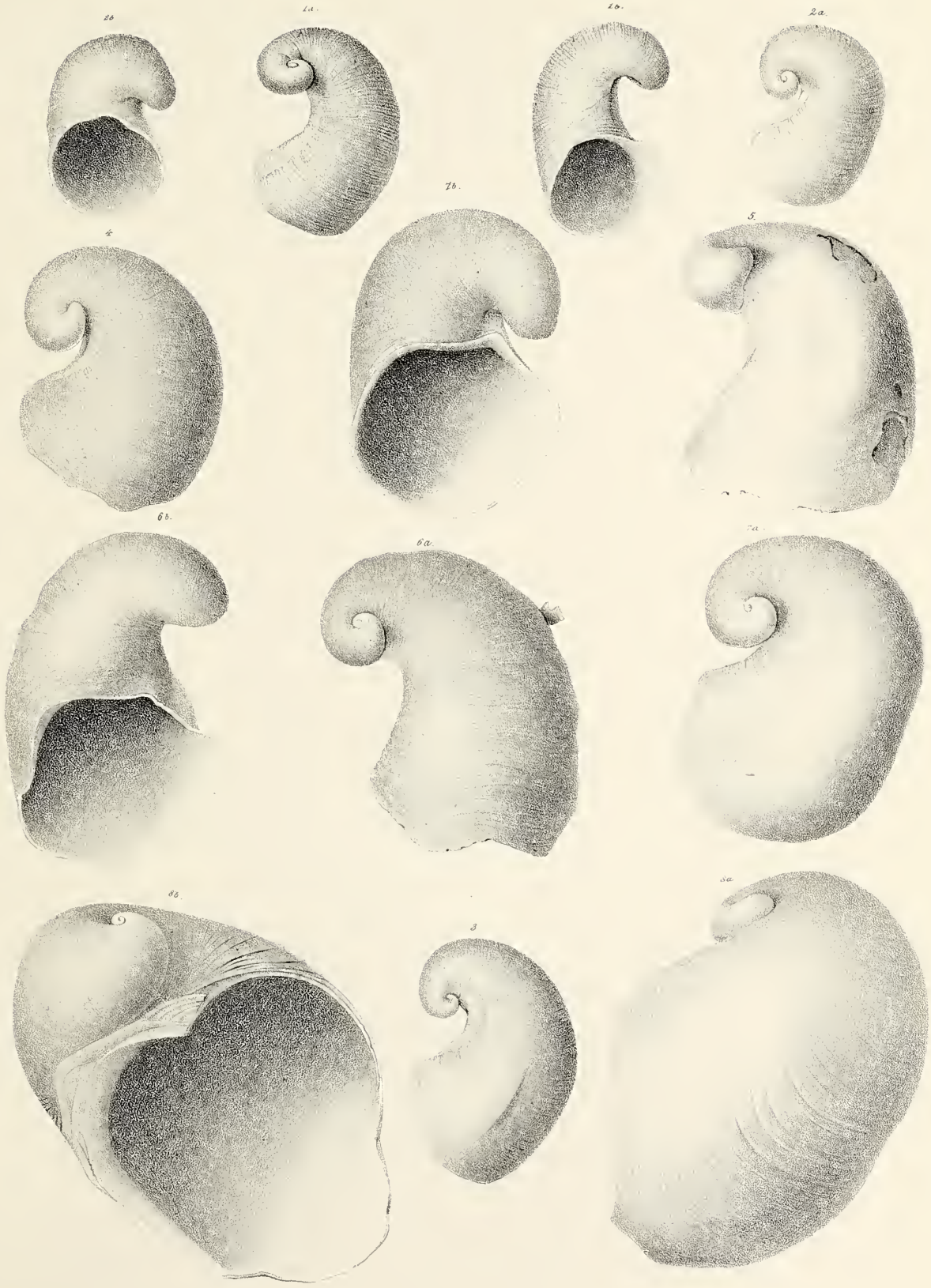
8 *a*. View of the back and upper part of the last volution.

8 *b*. View of the aperture, spire, and callosity of the columellar lip.

# ORISKANY SANDSTONE.

(GASTEROPODA)



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Swinton, lith.

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